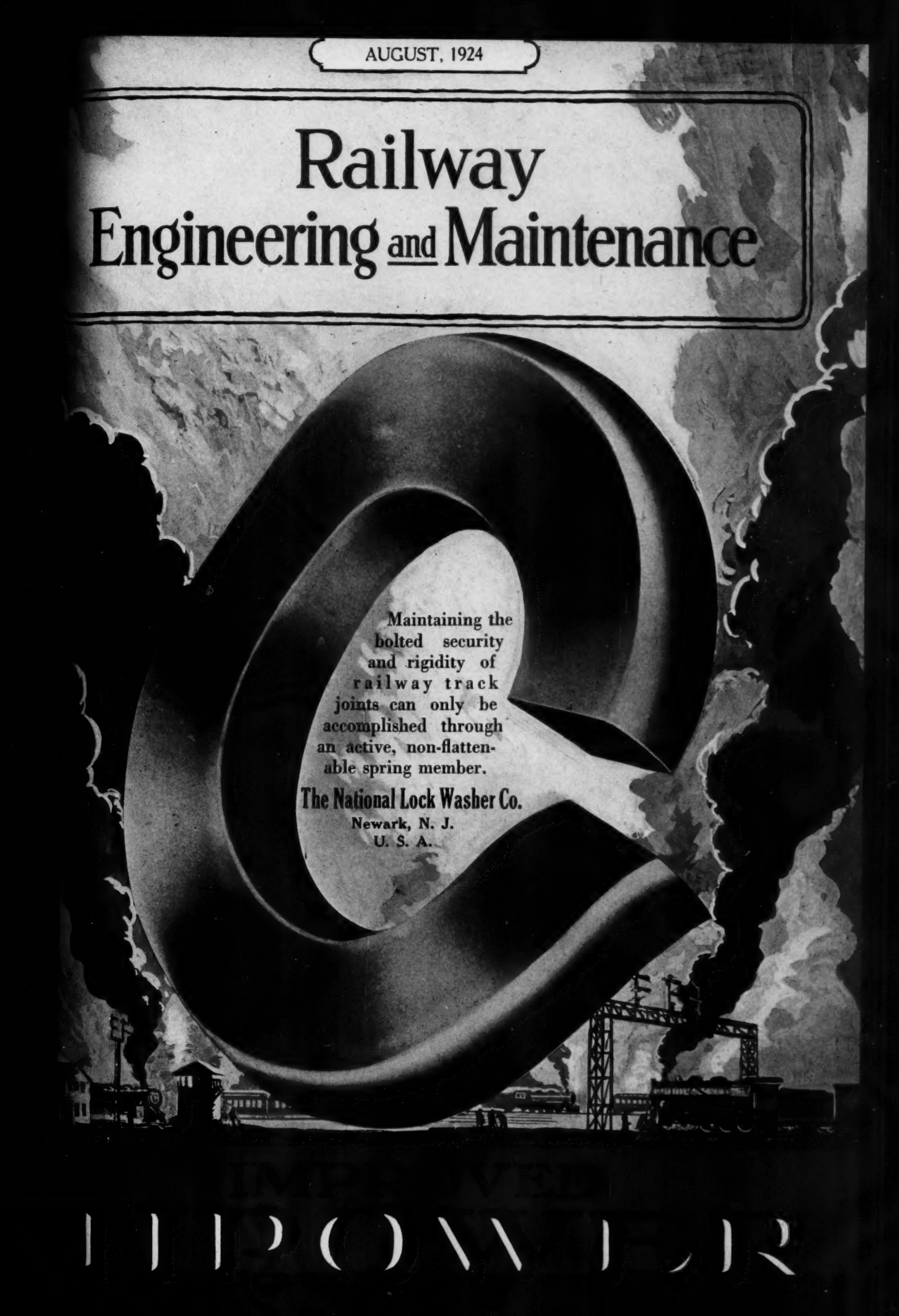
AUGUST, 1924

Railway Engineering and Maintenance



RAILWAY ENGINEERING AND MAINTENANCE
Entered as second-class matter June 23, 1916, at the post office at Chicago, Ill., under the Act of March 3, 1879. Published Monthly by Simmons-Boardman Publishing Company at 608 S. Dearborn St., Chicago. Subscription price, United States, Canada and Mexico, $2.00 a year; foreign countries, $3.00 a year.

Alphabetical Index to Advertisers, Page 36 Classified Index to Advertisers, Pages 34 and 36

The HORTON Softening Plant

Engine Performance is True Test of What Sludge Removal Means

Benefits of softening water with HORTON plants are actual, and make themselves evident the minute softened water hits the boiler.

"Sure does make a difference in engine performance," an engineman fairly shouted on being asked what he thought of the plants. "We used to have trouble with the boilers half filling with 'mud' and valves sticking, but now the part of the run that used to be the curse, is the best part of the division."

An engine crew is proud of its locomotive. They want their train to be taken through on time and in the most efficient manner. Softening water helps them do this. A writer in *Railway Engineering and Maintenance* tells how HORTON tanks remove sludge:

> "A test was made to determine the amount of water required to remove the sludge from a flat-bottom tank 22 feet in diameter after 12 hours' operation, during which time 120,000 gallons of water had been treated, the sludge amounting to approximately 520 pounds. About 5,000 gallons of water was wasted and while a great deal of the sludge was removed, the tank was not clean by any means and repeated opening and closing of the sludge valve brought quantities of sludge, the stream of water being clear with streaks of sludge through it. The tank was drained of all water and it was found that the openings in the sludge system collected the sludge for only a short distance around the openings and the sludge had accumulated to a depth of three feet all around the edge of the tank. There was also a great deal of sludge between the sludge lines. Examination of the tank proved conclusively that the removal of sludge in a flat-bottom treating tank is very expensive in the use of water and in most cases is inefficient and incomplete so far as the complete removal of the sludge is concerned.
>
> "A similar test was made with a conical-bottom treating tank 28 feet in diameter. After 60 hours' operation, during which time 1,000,000 gallons of water had been treated, and the sludge deposit amounted to over 4,000 pounds, it was found that 2,300 gallons of water was sufficient to remove the sludge completely. The practice on the Illinois Central is to wash the sludge out twice a day and the water required for this purpose rarely exceeds 1,200 or 1,500 gallons daily, while to do the same work in a flat-bottom tank would require 8,000 or 10,000 gallons, a conservative estimate of the amount of water saved daily being 7,500 gallons which, at the low rate of 15 cents per thousand gallons for pumping and treating means an annual saving of over $400 per year or six per cent on an investment of over $6,500."

You owe it to yourself and your company to investigate this remarkable plant. Its simplicity, economy and uniformity of treatment will be a revelation to you.

Any of our offices will be glad to give you complete information for your files or for transmission to other officials, without obligating you or your road in the slightest degree.

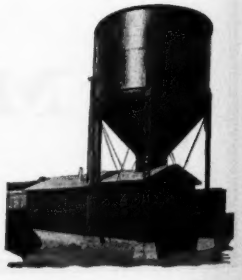
CHICAGO BRIDGE & IRON WORKS

NEW YORK 3156 Hudson Terminal Bldg. | CHICAGO 2452 Old Colony Bldg.
DALLAS 1646 Praetorian Bldg. | SAN FRANCISCO 1007 Rialto Bldg. | ATLANTA 1036 Healey Bldg.

HORTON STEEL WORKS, Ltd.

BRIDGEBURG 172 Janet St. | MONTREAL 1151 Bank of Toronto Bldg.

HORTON



Meeting of the Metropolitan Supervisors' Club at Bear Mountain Inn on the Hudson River.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 20 **August, 1924** **Number 8**

TABLE OF CONTENTS

WOULD YOU LIKE TO KNOW

How to remove a turntable circle wall with explosive?

How most motor car accidents occur?

How to build a snowshed?

How to drain gumbo roadbed?

How to make a man hour chart?

Answers to these and other practical questions will be found elsewhere in this issue

Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

NEW YORK: 30 Church Street **CLEVELAND: 6007 Euclid Avenue** **LONDON, England: 34, Victoria St., Westminster, S. W. 1**
NEW ORLEANS: 927 Canal Street **WASHINGTON: 17 and H Streets, N. W.** **Cable Address: Urasigmec, London**
SAN FRANCISCO: 74 New Montgomery Street

Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address please be sure to send us your old address as well as the new one.

Subscription price in the United States, Canada and Mexico, $2.00 per year; foreign countries $3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £-s-d.

Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)

Protect Your Blasting Investment by Using Superior Accessories

You can obtain maximum efficiency from your du Pont explosives *only* when you use accessories made to detonate these explosives.

In any blasting job you have too much money invested in explosives and work of preparation to run the risk of failure through the use of any but the best accessories.

With du Pont explosives use only the accessories bearing the du Pont Oval—then you'll get the results you're after. Their cost is small compared with the cost of the whole blasting job.

Du Pont has been making explosives and accessories for 122 years. This long experience is your insurance of highest quality.

Blasting Caps	Electric Blasting Caps
Delay Electric Blasting Caps	Fuse
	Delay Electric Igniters
Blasting Machines	Rheostats
Galvanometers	Cap Crimpers
Leading Wire	Tamping Bags

Write for Blasting Accessories Catalog containing descriptions and illustrations of du Pont accessories and practical information about their use.

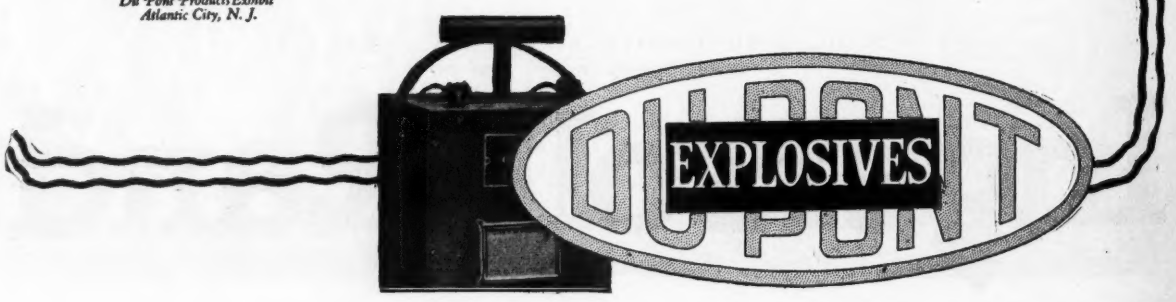
E. I. DU PONT DE NEMOURS & CO., Inc.

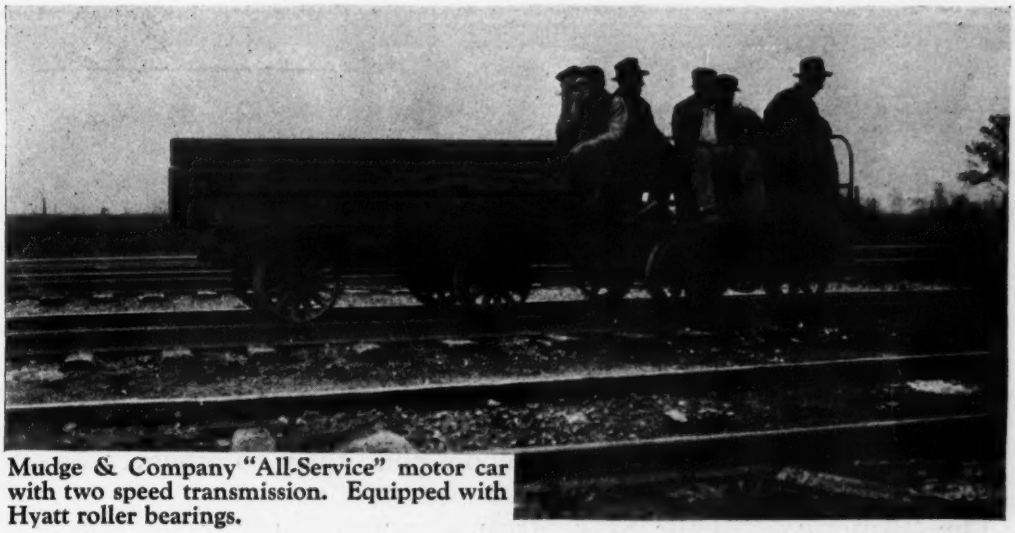
Explosives Department, Wilmington, Delaware

Branch Offices:

Birmingham . Ala.
Boston . . Mass.
Buffalo . . N. Y.
Chicago . . . Ill.
Denver . . Colo.
Duluth . . Minn.
El Paso . . Tex.
Huntington . W. Va.
Kansas City . Mo.
Mexico City . Mex.
New York . N. Y.
Pittsburgh . . Pa.
Portland . . Ore.
St. Louis . . Mo.
San Francisco Calif.
Scranton . . Pa.
Seattle . . Wash.
Spokane . . Wash.
Springfield . . Ill.

Du Pont Products Exhibit Atlantic City, N. J.





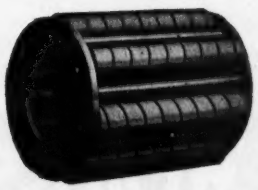
Mudge & Company "All-Service" motor car with two speed transmission. Equipped with Hyatt roller bearings.

Keeping Pace With Development

WITH the development of a two speed transmission for its motor cars, Mudge and Company adopted Hyatt roller bearings for the jack shaft. The long and satisfactory use of Hyatt bearings by this company settled the question of what bearings would best meet the requirements in this important position.

Hyatt bearings have come to be considered standard equipment on railway maintenance cars. Their outstanding advantages in keeping cars in continuous easy running service and the maintenance economies resulting from their use have led manufacturers of high grade cars to use them exclusively. They have convinced railroad men of the wisdom of specifying "Hyatt equipped".

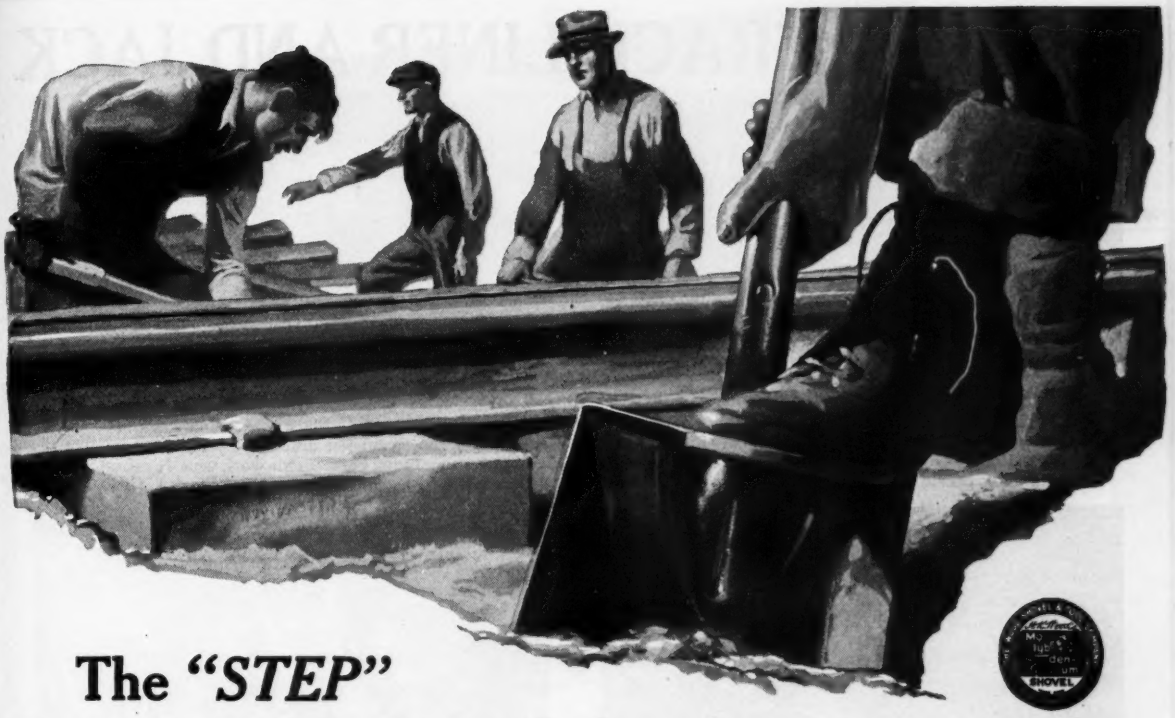
And it is not necessary to wait until new cars are needed to have Hyatt bearing equipment. Car manufacturers also furnish replacement boxes equipped with Hyatt bearings for installation on old plain bearing cars.



HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO
HUNTINGTON PHILADELPHIA PITTSBURGH MINNEAPOLIS
WORCESTER CLEVELAND MILWAUKEE

HYATT ROLLER BEARINGS FOR RAILWAY MAINTENANCE CARS



The *"STEP"* that has revolutionized shovels

EVER since shovels have been used, millions of men, the world over, have been pushing them into the ground with their feet. They have been wearing out their shoes—and in many cases getting sore feet—from continual pressure on the sharp edge. But no one thought to correct this condition until Wood invented the "step" shovel.

This "step," or turned over edge, has achieved a double purpose. Not only is the shovel easier on the men's feet and shoes—not only does it give better leverage—but it adds materially to the strength of the blade.

There are now more than 100,000 Wood's Mo-*lyb*-den-um Step Shovels in use—and not a single case of a broken blade. The men who are using them are enthusiastic—and acclaim this invention as the greatest shovel improvement in years.

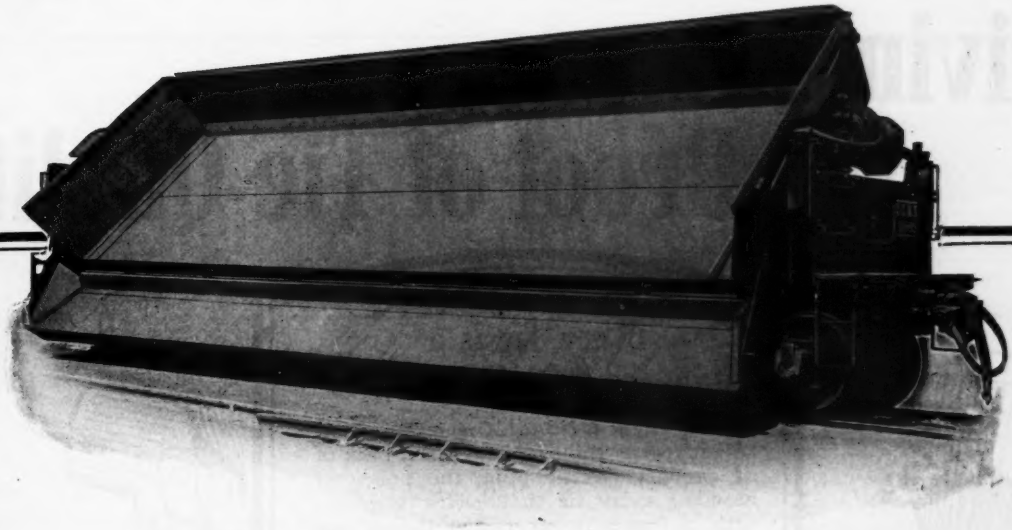
The Wood's Mo-*lyb*-den-um Steel Shovel has attained a standard of high quality which places it in a class by itself. It will outwear any other shovel made, from two to six times. This has been proved by actual tests. Large contractors who have adopted these shovels have cut their shovel bills in half. Write to-day for folder showing their application to all your needs.

THE WOOD SHOVEL & TOOL COMPANY
Piqua, Ohio, U. S. A.

Distributors of
Wood's Mo-*lyb*-den-um *Steel Shovels*

Atlanta, Ga., J. M. Tull Rubber & Supply Co.
Baltimore, Md., Codd Tank & Specialty Co.
Bessemer, Ala., Long-Lewis Hardware Co.
Bluefield, W. Va., Bluefield Supply Co.
Boston, Mass., Hedge & Mattheis Company
Boston, Mass., Sherburne & Company
Buffalo, N. Y., Beals, McCarthy & Rogers
Charlotte, N. C., Smith-Wadsworth Hardware Co.
Charleston, W. Va., Lowenstein & Son
Chattanooga, Tenn., James Supply Co.
Chicago, Ill., Barrett-Christie Company
Cincinnati, Ohio, Wm. T. Johnston Company
Cleveland, Ohio, W. M. Pattison Supply Co.
Columbus, Ohio, Dreher Supply Company
Dallas, Texas, Briggs-Weaver Machinery Co.
Danville, Illinois, Thos. Conron Hardware Co.
Davenport, Iowa, Louis Hanssen's Sons
Dayton, Ohio, M. D. Larkin Company
Des Moines, Iowa, Iowa Machinery & Supply Co.
Detroit, Mich., T. B. Rayl Company
Duluth, Minn., Marshall-Wells Company
Evansville, Ind., Evansville Supply Company
Fort Wayne, Ind., Fort Wayne Oil & Supply Co.
Houston, Texas, F. W. Heitmann Company
Huntington, W. Va., Emmons-Hawkins Company
Indianapolis, Ind., W. J. Holliday & Company
Jacksonville, Fla., Cameron & Barkley Company
Knoxville, Tenn., Tennessee Mill & Mine Supply Co.
Los Angeles, Calif., Brown-Bevis Company
Macon, Ga., J. S. Schofield's Sons
Miami, Fla., F. T. Budge Company
Montgomery, Ala., Alabama Machinery & Supply Co.
New Orleans, La., A. Baldwin & Company
New Orleans, La., Clyde Company
New York City, N. Y., Manning, Maxwell & Moore, Inc.
Norfolk, Va., Empire Machinery & Supply Corp.
Oklahoma City, Okla., Oklahoma Hardware Company
Omaha, Nebr., James Morton & Sons Co.
Pittsburgh, Pa., Frick & Lindsay Company
Portland, Oregon, Road Builders' Equipment Co.
Richmond, Va., James McGraw, Inc.
Rochester, N. Y., Sidney B. Roby Company
Rockford, Illinois, Swords Brothers Company
Saginaw, Mich., Morley Bros.
Salt Lake City, Utah, Salt Lake Hardware Company
San Antonio, Texas, Alamo Iron Works
San Francisco, Calif., Baker, Hamilton & Pacific Co.
San Francisco, Calif., Dunham, Carrigan & Hayden Co.
Seattle, Washington, Schwabacher Hardware Co.
Spokane, Washington, Holley-Mason Hardware Company
Syracuse, N. Y., Burhans & Black, Inc.
Tampa, Fla., Cameron & Barkley Co.
Toledo, Ohio, Bostwick-Braun Co.
Wheeling, W. Va., Greer & Laing
Youngstown, Ohio, Stambaugh-Thompson Co.

Wood's Mo-lyb-den-um Shovels
The American Super Steel



For Big Loads and Speedy Dumping

Substitute Air for Labor

More than 80 companies are using these 30-yd., 50-ton Extension Side Dump Cars.

THE bigger the job, the greater the need for the air operated Extension Side Dump Car. It provides a rapid and economical method of dumping any kind of a load and is regarded as a ***Labor Saving Device*** of the highest degree.

Dumping is economical. The 30-yard capacity plus the pneumatic method of dumping permits the unloading of large volumes without the use of costly hand labor.

Dumping is rapid. When dumping, the car body rolls to full dumped position in a positive manner and at the same time the side of the car turns out and down. These combined movements make it possible to discharge away from the track any kind of a load regardless of the size and weight of individual pieces.

These features are of vital importance in big jobs, because they make unnecessary the breaking up of large boulders and eliminate rehandling expenses.

Write for full particulars.

PITTSBURGH

CLARK CAR COMPANY

Oliver Building, Pittsburgh, Pa.

New York Office—52 Vanderbilt Ave.

Railway
Engineering and Maintenance

Volume 20 August, 1924 No. 8

TIMBER PRESERVATION PAYS

AN ARTICLE appearing on another page of this issue shows the record of tie renewals on two railroads which have been consistently committed to the use of treated ties and clearly demonstrates the marked reduction in the required renewals from year to year, as the consequence of treatment, and thorough protection against mechanical deterioration. A study of these data is invited. Obviously the economies to be obtained from the use of treated ties cannot be realized until a sufficient period of time has elapsed to develop the greater life of treated ties than of untreated ties, but after that the extra investment pays and pays well.

While such demonstrations of the advantage of timber treatment as those presented in the article in question merit thorough study they should be reviewed with caution since otherwise one might easily arrive at erroneous conclusions. For a number of years following the change to treated ties the annual renewals are subject to variation through a series of rather well-defined cycles. Thus for a certain period following the time at which untreated ties would have reached their ultimate life the annual renewals of the treated ties will be abnormally low. Then at the time when the first treated ties will have reached the end of their normal life the renewals will again increase for several years, following which the cycle will be repeated to a less pronounced degree until eventually a more nearly average rate of renewals will have become established.

This condition, as stated above, may lead to incorrect conclusions. For example, a study of statistics for the years during which the renewals are low may lead to the assumption that the anticipated annual renewals will be much less than may reasonably be expected from year to year. On the other hand, reports of tie replacements during the period when the renewals are passing through the increasing scale of the cycle may easily lead to belief that timber treatment is not of as much advantage as had been supposed and result in unwarranted criticism of those who had advocated its introduction. When, however, it is realized that these are thoroughly natural phenomena, the entire subject will be better understood and the real significance of the results to be obtained from timber treatment will be thoroughly appreciated.

ONE OF THE DIFFICULTES OF RAILWAY MAINTENANCE

IF THOSE who are so free in their criticism of the railroads had any knowledge of the difficulties with which the railroads are confronted in conducting their affairs, they would be less given to an expression of adverse opinions. One often hears of comparisons between the methods followed by railroads and those prevailing in the business house or factory to the entire disadvantage of the former but which take no account whatever of the difficulties under which the railroads must carry on their work.

A striking illustration of this is to be had in the painting of roadway signs, as suggested by an article appearing on another page of this issue. Many of these signs are to be found in large terminals, but, for the most part, they are widely scattered over the great mileage of the railroads of this country, many of them in sparsely settled territories. The painting and repairing of these signs not only involves the preparation of portable equipment which will enable the painting crew to move from sign to sign with the least possible delay but it also entails camp and supply cars to serve as the traveling headquarters for the gang as it moves over the division. But even with the best of facilities, the hours of productive work which can be obtained from paint gangs within the allotted time each day, fall far short of the accomplishments of the painters in building construction or factory production. There would be some gain if the same degree of supervision could be exercised in each case, but this in itself is out of the question, the paint foreman in the factory is subject to daily observation by the works manager, while the maintenance of way master

YOU MAY BE NEXT

One out of every 20 persons at work in the United States met with a serious accident last year. These accidents caused those injured to lose 227,000,000 working days or an equivalent of more than 75,000 men laid up for the entire year. If their time is valued at $4.50 a day, the loss in wages exceeded $1,000,000,000, in addition to the pain and suffering brought on the injured ones and those dependent on them. The railways have made a marked improvement in their accident record in recent years. However, preventable accidents still form one of the largest avoidable wastes in the transportation industry. Most accidents to maintenance of way employees result from carelessness on the part of some individual. They can be eliminated if every employee will exercise care for himself and those who work with him. Those men who will not take these precautions are not fit employees for a railway and their presence in a gang should not be tolerated for they may bring misfortune to their associates as well as themselves.

painter is left to his own resources a very large portion of the time and must carry on his work without the guidance of his superior and in the face of the greater difficulties which are imposed on him.

THE FOLLOW UP IS EQUALLY NECESSARY

ONE OF THE most important duties of the supervisory maintenance officer is to be constantly on the alert to detect conditions which should be corrected and to call them to the attention of the persons responsible for their elimination. It is another and equally important problem to follow these suggestions up to see that they are accepted and the work done. Yet one frequently finds the one without the other. This is unfortunate for several reasons.

In the first place if the defect was sufficiently important to warrant a supervisory officer in calling attention to it in the first place, it was of sufficient magnitude to require correction and the necessary steps should be taken to insure that this is done. Furthermore, if a foreman or other employee to whom such instructions are given learns that he is not being checked up regarding their execution, he soon begins to give them little consideration himself and their value is lost.

In following up instructions, however, a supervisory officer must be considerate of the demands on the time of his men and not expect them to drop important work on which they may be engaged for less urgent matters if he is to avoid the disorganization of his forces. Rather, he should give his men reasonable time to do the work requested in the orderly conduct of their operations, barring emergencies or defects affecting safety of travel but after allowing such time, should see that his instructions have been followed.

INSIST ON CO-OPERATION

THE ARTICLE which appears on another page of this issue describing the methods pursued in renewing a turntable is illustrative of the elaborate plans and carefully organized procedure which must be carried out in order that such changes may be made with the minimum interference with the operation of the engine terminal. It presents an excellent illustration of a high degree of co-operation between the maintenance and operating forces and, in general, it may be said that this is typical of the attitude that prevails when work of this kind is carried on. However, it is an unfortunate fact that the conduct of the less important maintenance operations on turntables are not always attended by this spirit of co-operation on the part of the roundhouse and operating organizations. When such work as the overhauling or adjustment of the centers or the end trucks or the renewal of the deck is undertaken the bridge foreman is frequently confronted with an attitude of seeming indifference on the part of the roundhouse foreman. He is informed, in a word, that he must carry on his work as best he can with no interruption whatever in the use of the turntable. As a result, he and his men are compelled to waste a large part of their time during the frequent turnings of the table, so that the charges for the work are far in excess of what they would have been had they been enabled to do their work under more favorable circumstances. At the same time they are kept on this job much longer than necessary with the result that the season's working schedule is seriously disarranged. This situation is brought about in part by the fact that the bridge foreman, being a man of minor authority, receives scant consideration from the mechanical officers and clearly points to the necessity for the master carpenter or bridge supervisor to do everything in his power to place the problem before the operating officers in such a way that they will appreciate the necessity for some concession on their part in order that the work may be efficiently done, or failing to obtain results in this manner, to refer the matter to his superiors in his own department in order that they may bring sufficient pressure to bear to obtain such modifications of the working conditions as will make it possible to carry on the work with reasonable efficiency.

AN EMPLOYEE'S OPPORTUNITY

THE RAILWAYS are now handling less business than they were a year ago. During the month of June, 1924, the number of cars loaded was 413,131 or 10 per cent less than in the same month of last year. The railways have the facilities to handle more traffic. Lack of it is decreasing their earnings and bringing about a curtailment in expenditures and reductions in forces. The employees can do much to counteract this decline by utilizing every opportunity to influence the routing of passengers or freight shipments over their road. This can be done in a number of ways as is pointed out in an article in another column of this issue.

No small part of the loss in revenues has been caused by the inroads of the motor bus and the motor truck. In their desire to aid a fellow townsman in establishing himself in the trucking business, merchants frequently lose sight of the fact that they are decreasing the earnings of other citizens and customers of theirs who are dependent on the railways for employment and are also threatening to curb public improvements by striking at the success of one of their heaviest tax payers.

The presentation of the railway's case by an employee among those with whom he comes in contact will do much to hold and to restore traffic. Furthermore, at many points traffic is competitive between two or more roads and an employee who has the interest of his railway at heart can assist materially in securing a large part of it for his line.

HOW THICK IS A ONE INCH BOARD?

EVERY USER of wood knows that a one inch board is not one inch thick and further that this deficiency is not the same in all boards. The same conditions prevail in dimension timbers, in fact, in almost all sawed lumber. This lack of standardization in the manufacture of lumber is of long standing and most people have assumed that it represented a trade practice which must be accepted. However, with the growing realization of the general lack of standardization in American manufacturing practices which was brought to a head during the course of the World War, a movement was set on foot for the correction of these unsatisfactory conditions with the result that much progress has been made in simplified practices, and notably in the lumber manufacturing industry.

The first efforts towards the correction of this condition as regards lumber were made in 1919 when a convention of the American Lumber Congress adopted an organized program for the simplification of lumber practices and under the leadership of Secretary Hoover of the Department of Commerce, representatives of all interests were organized into a Committee on Lumber Standardization. After an enormous amount of work this committee came to an agreement on December 13, 1923, which took the form of specific recommendations for the standardization of certain lumber practices. These cover the classification of lumber as to use, namely, yard lumber, structural timber and shop and factory lumber; standard nomenclature for the usual sizes embraced in each class; standards of actual thickness and width for

the nominal sizes of boards and dimension lumber, and certain rules covering grading, shipments, inspection, etc.

Probably the most important item in the work of this committee is the standardization of the thicknesses and widths of lumber yard sizes. Thus it was decided that a standard board shall be 25/32 in. thick and that standard two inch dimension lumber shall be 1⅝ in. thick. In addition, provision was made for what are known as "extra standard" sizes which, for one inch, is 26/32 in., and for two inch, 1¾ in. Similarly as to widths it was decided that the actual width of a board 8 in. wide or less shall be ⅜ in. less than the nominal width and that boards wider than 8 in. the actual width shall be ½ in. less than the nominal width.

The committee's plan calls for additional work looking towards the extension of these standards to other phases of the manufacture and distribution of lumber. But pending such action it is the desire of the committee that the users of lumber adopt the recommendation which the committee has already set up. To this end the Department of Commerce has broadcasted the recommendation of the committee, urging that all concerned with the production and use of lumber signify their intention of adopting these simplified practices for the 12 months beginning July 1, 1924.

ETERNAL VIGILANCE

THE MENACE of the cloudburst, together with its dire consequences in the form of washouts and train accidents, is beyond doubt the greatest source of anxiety to the bridge supervisor. He may have every reason to feel that he is exercising every precaution humanly possible to protect the bridges under his care, yet he knows that they cannot all be made absolutely secure against the extraordinary conditions that follow the local rainfall of unusual severity and which may come "out of a clear sky" almost any time and at any point in his district. He realizes also that he and his bridge foreman alone cannot see all of the bridges after each heavy rain, that he must depend in large part on the loyalty and vigilance of the track foremen and that a lapse on the part of any one of them may result in disaster at any moment.

As a case in point is a fatal washout accident which occurred in daylight two hours after a heavy torrent of rain carried away a frame bent in a trestle without disturbing the alinement of the deck or the track so that a train, traveling at very low speed, was wrecked because the engine crew found nothing to alarm them at they approached the structure. We are not concerned here with the question as to whether the foreman actually inspected the bridge or whether such inspection as he may have made was so perfunctory that he failed to discover the dangerous condition of the structure. It is clear, however, that a thorough, conscientious inspection of the structure prior to the passage of the train would have disclosed its true condition with the result that the train would not have been allowed to pass over it.

It is, of course, difficult to draw any pertinent moral from such an incident. If we are to assume that the failure of the bent was in no wise the result of undermining which should have been anticipated by the supervisor in his periodic inspections of the structure, it would seem that the accident must be ascribed to a characteristic failure of the human factor. Aside from this there is, of course, the possibility of speculation as to what further steps the management of the railroad could have taken through its supervisory organization to impress on the section foremen how exceedingly necessary it is for them to protect trains against all possible emergencies.

Letters to the Editor

THE SUPERVISOR'S RESPONSIBILITY

Lincoln, Nebr.

To THE EDITOR:

Supervision is the keynote of successful railroad operation. A railroad is equipment. It is properties and bonds. But above all these, a railroad is men. Alfred H. Smith, late president of the New York Central lines, said, "A railroad is 90 per cent men. But men must have supervision."

In a sense, there is the material for good work in every man, not only in those who are brilliant and quick, but also in those who are stupid and slow; but all require leadership. "Are you that leader?" is a question for every supervisor and likewise for every employee who looks forward to becoming one.

A supervisor must be trained, not only in experience but in ability, to think and act with little delay and to render sound decisions, regardless of the emergency or occasion. He must have a clear vision, must see details, weigh motives, and forecast the future. He cannot lack courage or determination and must be able to cultivate the habit of concentrating attention upon the problem in hand.

A supervisor must be a man of decision. He needs observation to see, discrimination to decide, and firmness to hold to his deliberate decision. Count the cost, but never brood over difficulties. Seek a knowledge of the meaning of defeat or the significance of success, but never act contrary to your clearest judgment. Take all advice that is offered but act upon your own judgment, insisting first upon seeing clearly all possible consequences. Keep cool, for confusion is mental anarchy. "First weigh, then venture" was the motto of a famous general. He was cautious in planning, but daring in execution. He was always successful.

You also have duties toward your men. Remember that the best rule in the control of others is the Golden Rule, for a friend is always worth more than an enemy. Never permit your general opinion of a person to blind you to his qualities. When Alfred H. Smith was a laborer in a construction gang his foreman tried to get rid of him. A supervisor's job is to make men, not to break them. Permit them to have views, and if they know more about a subject than you do, don't try to down them. If you have unpleasant opinions, keep them to yourself and refrain from making remarks about others which you would not instantly make in their presence. If you make promises, fulfill them. If you must use discipline, make it an ally, not an enemy. And when men talk, let them know that you are in harmony with the management.

There are two specific classes of supervisors. In one are those who are content to follow the established routine, and in the other those who strive for efficiency and production. With operating expenses increased many times in the last few years, it behooves the supervisor to increase production and at the same time strive for more economic operation. If you cannot do it someone else can. Production is necessary. One must work with his hands, another may work with his hands and brain, but the greatest producer is the one who thinks, plans and directs. He alone makes great things possible.

W. B. ZIMMERMAN,
Yard Supervisor, Chicago, Burlington & Quincy.

Turntable Renewal Is Accomplished Under Difficulty

Interesting Variations From Usual Methods Were Introduced in Solving This Common Problem

By R. C. HENDERSON
Master Carpenter, Baltimore & Ohio, Dayton, Ohio

THE REPLACEMENT of a 90-ft. turntable by one having a length of 100 ft., at the engine terminal of the Baltimore & Ohio at Lima, Ohio, was complicated by the fact that it was necessary to make certain alterations and repairs to the top of the center foundation between the time that the old center was removed and the new one was inserted in its place. The manner in which this and other problems presented in connection with the installation of the longer turntable were solved should prove of interest to bridge and building officers.

As soon as it was decided that Santa Fe-type locomotives, which had been ordered from the Lima Locomotive Company, were to be used on the engine districts terminating at Lima, authority was granted for the replacement of the turntable by one of greater length and instructions were issued to proceed with the work so as to cause no delay in the handling of the new engines when they were delivered. The new 100-ft. table was delivered and unloaded as near the site as possible and a foreman and 10 men started work in the pit on May 18, 1923.

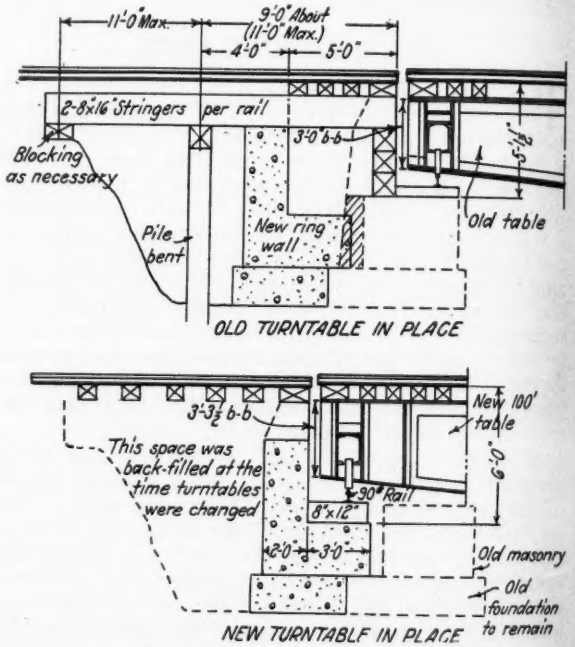
Used a Derrick Car for Excavating

The first operation was to remove the old brick paving and excavate the pit to an additional depth of 24 in. The excavation was handled by placing a steam derrick car on temporary radial tracks constructed for that purpose where space would permit and in line with permanent radial tracks on the opposite side of the table. Two wooden hoppers were used for elevating the dirt from the pit to a flat car spotted on temporary radial tracks. These hoppers were constructed of three-foot planks with an open end to permit dumping, the height being such as to permit the old turntable to clear them in the pit when it was in operation. This permitted men to fill the hoppers at any location in the pit, and use the derrick car to hoist them into the cars with very little delay. As a result, a large percentage of the excavation was handled without the use of wheelbarrows.

The derrick could be shifted over the turntable and spotted on any of the other temporary radial tracks or on any of the permanent tracks when they could be used without delaying the movement of engines in and out of the house. At times when this could not be done wheelbarrows were used to move the dirt to the hoppers which were placed in the pit within reach of the derrick. Four flat cars were used with 2-in. by 12-in. planks placed along the sides in such a way that they could be removed to permit quick unloading. As soon as the cars were loaded they were shifted over the table with the aid of a cable from the derrick car to a spur track where they were picked up by a yard engine and hauled away for unloading. Four cars were employed on this work, two being unloaded while the other two were being loaded.

Some difficulty was experienced in the excavation of the pit as it was necessary to remove an old turntable foundation of stone and timber that had been abandoned years ago. It was also found necessary to construct new drains for the pit as the old connection to the city sewer was too high to give the necessary fall from the lower level of the pit. This made it necessary to provide a connection to a new 36-in. storm sewer at a distance of 600 ft. from the nearest point of the new pit. This connection was completed before the pit excavation had progressed sufficiently to give trouble with water.

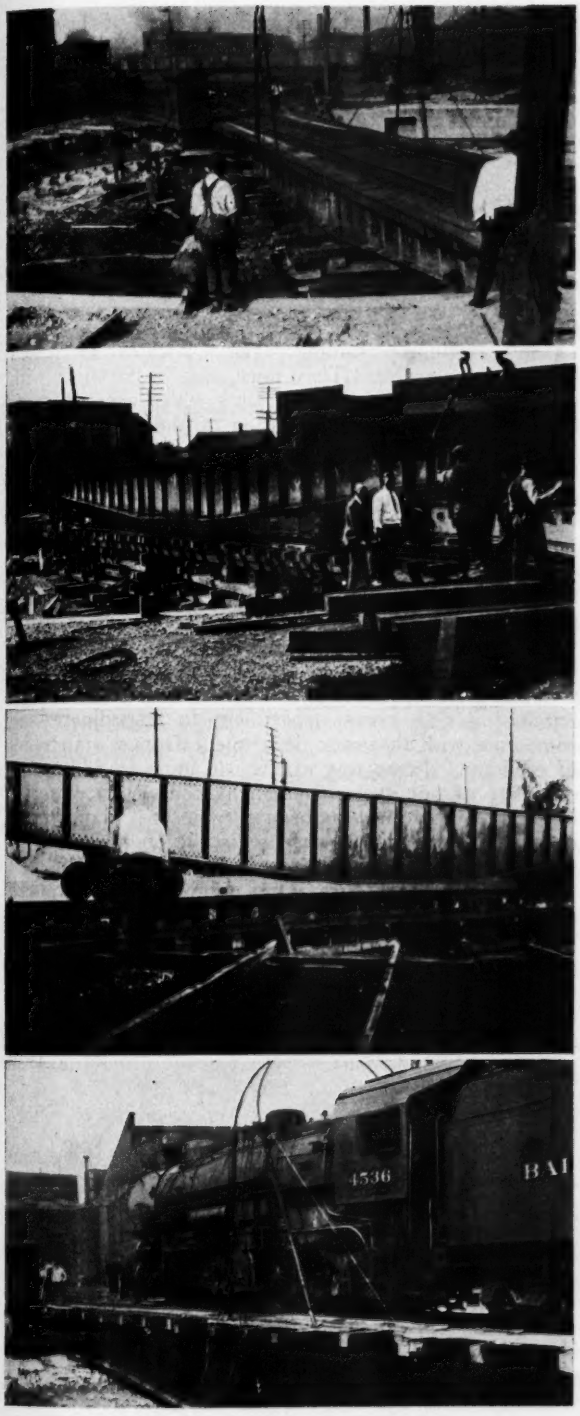
The next operation was the removal of the old concrete circle wall to the elevation of the bottom of the circle ties. This was done by blasting the concrete with



Two Stages in the Renewals of the Circle Wall

dynamite. Holes were drilled into the wall on the inside face to a depth of half the thickness of the wall while other holes were punched or drilled in the earth back of the wall. A small amount of dynamite was placed in each hole, the charges being timed so that the explosion of the charges in the wall would occur a few seconds sooner than of those placed back of the wall. This was found to be very successful as the charge in the wall would crack the concrete sufficiently so that the explosion of the charge back of the concrete would blow a section of the wall into the pit. This concrete was removed in the same manner as the other excavation and shipped to points on the division where it was used for rip rap.

As fast as the concrete wall was removed it was replaced with timber cribbing, using second-hand 8-in. by 16-in. stringers. Bents of three piles each were then driven back of the old circle wall under the 15 per-



Four Steps in Replacing the Turntable

Placing Cribbing Under the Old Table.
The Old Table on the Car Trucks.
Rolling in the New Table.
Turning the First Engine on the New Table.

manent radial tracks. These bents were placed a sufficient distance behind the old wall footing to give plenty of room to place the footing for the new circle wall. They were capped low enough to permit using two 8-in. by 16-in. stringers under each rail, these stringers being supported on the bents, the cribbing and blocking as shown in the sketch. The work of supporting the radial tracks was handled with practically no delay to locomotives, as the tracks were taken out of service one by one at a time most convenient for the roundhouse foreman whose co-operation was of great assistance.

Start Work on the New Circle Wall

On July 21 enough tracks had been supported so that a mason gang could start excavation for the new wall and place forms for the concrete. This was started with 12 men and a foreman, the excavation being handled the same as the pit excavation. As the excavation progressed, forms were placed and the concrete poured. Four sets of forms were constructed in sections 10 ft. long, two being placed and filled by continuous pouring and shifted ahead as fast as the excavation permitted. As the work progressed men were added to the two gangs as needed but at no time were more than 30 men employed.

When all tracks had been supported, work was started on the removal of a portion of the old circle wall foundation, as it was found necessary to do this to permit the placing of the new circle rail ties. While this work was in progress it was again necessary to take the radial tracks out of service, one at a time, to permit the temporary removal of the cribbing placed on the old wall footing. Most of this concrete was cut down by three pneumatic riveting hammers with special chisels 24 in. long, air being furnished by temporary piping from the engine house. As this work progressed the circle ties were set and the concrete placed between them. The new 100-lb. circle rail was also placed after being bent to the required circle with a jim crow bender. The circle rail was spiked to every fifth tie to permit adjustment to conform with the end carriage wheels on the table if found necessary.

Make Arrangements for the Change

The work had progressed to the point that it was possible to fix September 28 as the day to make the change of tables. Arrangements were made with all concerned to put the table out of service for 24 hours. This time was required as it was necessary to level up the old center footing with two inches of concrete and allow a reasonable time for setting before putting it under load. It was decided to remove from the engine house all power that would be required during the 24 hours and do any turning of engines necessary on a wye located one-half mile from the engine house which had previously been put in good condition for this purpose.

At 6:30 a. m. on the date set the table was raised by "teetering" it on cribbing with the help of a 70-ton crane at one end. (Two cranes could not be used for lack of track room). The cribbing was made sufficiently strong to carry the crane.

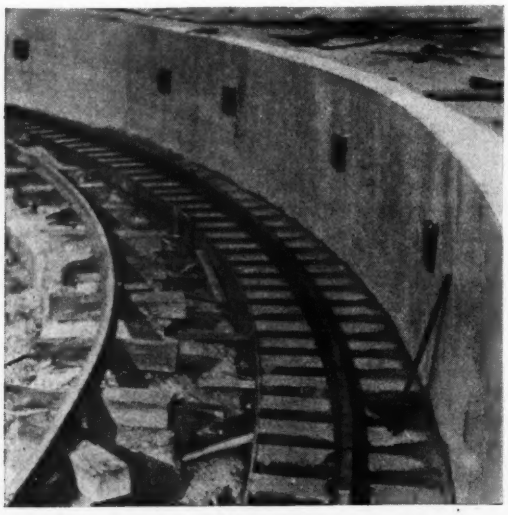
The table was raised a sufficient amount to permit the placing of a temporary track on the cribbing in the pit, so that specially prepared car trucks could be placed under each end of the table for the purpose of hauling it out of the way. This done, the derrick was run on the temporary track to remove the old center and the granite block so as to permit the necessary work to be done preparatory to placing the new center. This work consisted of cleaning off the old concrete foundation and raising it about two inches, using a mixture of one-third sand; one-third cement and one-third steel shavings to make the foundation level and at the proper elevation for the new center.

While this was being done other men were removing the old circle rail and ties, using the derrick car on the temporary track. It will be noted that the new turntable would not clear the top of the old circle wall. This

had been taken care of previously by cutting down the concrete and substituting blocking under the ties. Other men were pulling drifts and bolts from the stringers under the radial tracks, using the derrick car to pull the stringers into the pit, lifting them out and piling them in a space provided clear of the radial tracks. At the same time trackmen were backfilling under the radial tracks behind the new circle wall and tamping the ties so that all work necessary for operating the new table was completed before the new concrete on the center foundation was set sufficiently to receive the new center. It would have been possible to have postponed this backfilling by cutting off the stringers in line with the new circle wall and removing them later, but this would have destroyed the stringers which were of sufficient length to use in permanent bridge work.

Placing the New Table

The new center was set at 3 p. m. and at 5 p. m. the new table was placed on the car trucks, which had been released from the old table, and lowered into place in the



The New Circle Wall. Note the Old Circle Rail Supported on Blocking

same manner as the old table had been removed. As the lowering progressed the cribbing material was removed from the pit with the derrick car. The new deck and rail were placed on the table while the lowering was under way, the deck having been framed previously. When the crane was released from the new table it was used to set the tractor and metal supports for the collector ring and was released from duty at 11 p. m. The bridge and building forces were also released at this time, with the exception of a few men who were held to assist the electricians who were completing the wiring to put the tractor in service, however, before releasing the bridge and building men a box car was set on the table and turned by hand. The electricians completed their work and the first engine was turned at 10 a. m., on September 29.

Much credit is due every one concerned, especially the two bridge foremen who handled the work with gangs consisting of inexperienced men and with a heavy labor turnover. There was no delay to traffic during the progress of the work and no one was injured. Credit is also due the operating department for the way power was handled during the time that the turntable was out of service. In order to reduce the necessity for using the wye, engines coming into the terminal from the south were assigned to take northbound trains out of the terminal and vice versa. This work was handled by the writer under the direction of R. E. Chamberlain, division engineer, Dayton, Ohio.

The Track Supervisor and the Purchasing Department*

By N. M. Rice

General Purchasing Agent, New York, New Haven & Hartford, New Haven, Conn.

THE TRACK supervisors of today must be up-to-date in everything pertaining to the department for which they are responsible. They must also be familiar with the workings of other departments which are necessary to the maintenance and operation of the railroads as a whole. The future success of each man depends upon how well he is sold to his work and the price he has paid and is willing to pay for that success.

The purchasing agent's duties are exactly like the supervisor's, full of details which at times are so numerous they become monotonous. No doubt, many of us have said, "What's the use. Let well enough alone and take it easy." If we actually did that the final result would be receivership for the railroad unless we were removed and our places filled at once with men of vision and energy. We all know how necessary it is for the purchasing and stores department to co-ordinate and co-operate with the track department from a standpoint of economy. In no way can we do more to add to the efficiency of our operation than by conserving material. Material is now and has been for the past six or eight years a large factor of expense in the operation of the railroads and has kept a close second to labor in total cost. Prices have, during this same period, advanced at an alarming rate. At times it has been almost impossible to obtain the many supplies needed to operate the railroads. It is, therefore, imperative that each one of us practice economy in the use of material and supplies. To do this, we must see that no more material is ordered than is needed and that we do not hold in our possession or under our jurisdiction, more material than is required to meet our immediate needs.

Some Important "Dont's"

Don't make duplicate requisitions. No one thing contributes so largely to excessive stock as the making of duplicate requisitions. We all know, despite the instructions issued from time to time to the contrary, that some of our employees will continue to order the same article month after month. On our return to our various headquarters we should investigate at once and should we find a requisition placed with the stores department for an item of material which is absolutely required pertaining to which delivery has not been made, promptly write a letter to the storekeeper to whom the requisition was sent, giving the number and date, and ask him to hurry the material. If not required, cancel the requisition at once.

Don't fail to maintain a complete record of unfilled requisitions. The lack of a proper requisition record is sure to result in the ordering of more material than is actually required. It is well to scrutinize all requisitions before signing to see that the quantities ordered are standard to stock and are no greater than required. By all means eliminate material specified that is not positively required. Don't permit clerks or any person unfamiliar with standards to approve requisitions.

*Abstracted from a talk before the annual outing of the Metropolitan Track Supervisors' Club on June 5.

Don't order non-standard material, because it was the practice of your predecessor, when standard stock items will answer the requirements.

Don't fail to request the cancellation of requisitions in case of a change in the working program, reduction in force or from other conditions that will prevent the use of the material for which you have made requisition in good faith.

Be sure to see that all employees under your jurisdiction are made familiar with the price of each article with which they come in contact from day to day. By knowing the values, they are sure sooner or later to take a greater interest in the conservation of material.

Keep an orderly house at all times. Cleanliness on the right-of-way and at stations will do more to advertise your roads effectively than anything else in the world. Don't shift the responsibility or in railroad vernacular, "Pass the buck," by transferring your responsibility for economic practices in every form to others. Always bear in mind that the efficiency of each promotes the efficiency of all.

Coyote Shot Moves 45,000 Yd. of Ballast

BLACK BUTTE, a high rocky hill of volcanic origin near Havre, Mont., was recently the scene of an interesting blasting operation, made under circumstances which rendered its successful outcome dependent on the accuracy of the judgment of the natural conditions and the explosives' power. It was made for the purpose of securing a supply of ballast for the Great Northern. A number of conditions raised a doubt as to whether this could be done successfully, but J. C. Horgan, explosives

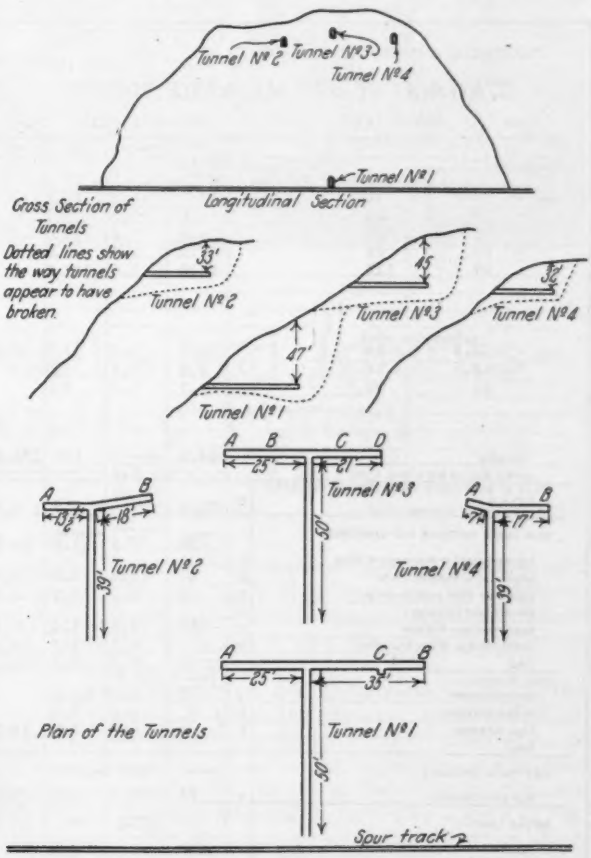
The Blast Caused Dust and a Little Smoke

engineer of the du Pont De Nemours Company, who was assigned to the work, finally succeeded in overcoming the doubts of those who were uncertain about the success of such a shot and was given authority to go ahead.

The method adopted in attacking the problem was to drive into the hill three 4-ft. by 4-ft. tunnels, with cross-cuts from 17 to 21 ft. long at the end. The explosive charge consisted of 17,500 lb. of black blasting powder and 1,100 lb. of gelatine dynamite. Not only was it necessary to get enough explosive into the tunnels to move the material, but it was also important to avoid overloading because a gravel surfaced state highway ran directly in front of the shot only 400 ft. away and a high power transmission line was located directly in front of the shot at a distance of only 350 ft.

The black powder was loaded in the kegs in some of the pockets and out of the kegs in others for the reason that several of the pockets had not been made large enough to hold the black powder in the kegs. Each pocket was loaded with a 50-lb. case of 60 per cent gelatin as a priming charge, except in pockets "a" and "b" of Tunnel No. 3. In these pockets 40 per cent "straight" was used, loading them with more dynamite than the other pockets, as indicated on the sketch.

The temperature at the time of loading the tunnels was 15 deg. below zero. The powder and dynamite



Layout of the Tunnels

were stored in an ordinary dugout magazine with a wooden front. The temperature of the magazine was about 10 deg. below zero. The dynamite was in excellent condition, although, to make sure, the cartridges that contained the electric blasting caps were warmed up.

Two electric blasting caps were used in each pocket with the caps wired out to 12 in. long and connected in series with a No. 14 lead wire. To make sure that any charge could be fired that should happen to miss, an auxiliary set of primers and wires was installed, although as all of the pockets fired on the first shot it was not necessary to make use of any of these auxiliary lines and primers. The wires were carried out of the tunnels by being suspended on hooks at the top. This saved considerable expense in laying the wires on the ground, and at the same time prevented the wires from being pulled apart or broken by the men when tamping.

In the placing of the electric firing equipment great care was exercised—each electric blasting cap was tested with a galvanometer; each pocket circuit was tested; and after the tamping started each circuit was

tested every 10 ft. The tunnels were connected in series; 1,500 ft. of lead wire (No. 14) was used, and the shots were pulled with a No. 3 blasting machine, which was thoroughly tested with a rheostat. Although the tunnels were perfectly dry, each wire connection was thoroughly taped, as it is not considered good practice under any conditions to attempt to fire a shot like this without seeing to it that all electrical connections were tightly wound and thoroughly taped. The tunnels were tamped solid to the mouth.

Upon the plunging of the blasting machine rack-bar there seemed to be a pause. Then suddenly the earth began to tremble and there was a muffled roar as the side of the hill slid down upon the side track. After the dust had cleared (for there was only dust and little or no smoke), it was estimated that the shot had resulted in the moving of from 40,000 to 45,000 cu. yd. of rock.

FORM 442-Revised Jan. 1923

LOUISVILLE & NASHVILLE RAILROAD CO. MAIN STEM FIRST Division or Branch.

STATEMENT OF MAN ALLOWANCE REQUIRED

From March 1st, 1923 To February 28th, 1924

DO NOT USE THESE COLUMNS

			Miles	Men per Mile	Men	Total	Miles	Men per Mile	Men	Total
Weight of heaviest engines 302000 lbs. to 220000 lbs			MP 50 MP113							
FIRST MAIN TRACK From 4.6 To 16			13.8	1.5	20.7			1.25	17.2	
16.	24		8.0	1.7	10.2			1.50	9.0	
24	32		8.0	1.5	12.0			1.25	10.0	
32	39		7.0	1.7	11.9			1.50	10.5	
39	113		74.0	1.5	111.0			1.25	92.5	
SECOND MAIN TRACK From 4.6 To 16		A	13.6	1.3	17.7			1.06	14.4	
16.	24		8.0	1.5	9.0			1.27	7.6	
24	29.7		5.7	1.3	7.4			1.06	8.0	
Total Miles			134.1		Total	199.9			Total	167.2
Average Men per Mile of Main Track				R 1.5				1.25		
MILES OF MAIN TRACK PROTECTED BY AUTOMATIC SIGNALS 5% Additional % Automatic Signals		B	10.0	0.09	S 0.9	0.9				0.8
MAIN TRACK SWITCHES AND CROSSINGS			Number 138	Equivalent Miles 6.9	Men per Mile 1.5	10.3	Number	Equivalent Miles	Men per Mile	
Non-interlocked or Non-signalled Track		C								
Interlocked or Signalled Track		D	20	1.1	1.5	1.6				
Diamond or Right Angle Crossings		E	1	0.1	1.5	0.1				
Movable Point Crossings		F								
Road Crossings—Ordinary		G	318	6.3	1.5	9.5				
Road Crossings—Paved or Planked		H		0.1	1.5	0.9				
Total				14.5	1.5	21.7			1.25	18.1
SIDE TRACKS:—			Miles	Men per Mile			Miles	Men per Mile		
Heavy Movement		J	27	0.5	13.5					
Medium Movement		K	6	0.4	2.4					
Light Movement		L	4	0.3	1.2	17.1				
Total										17.1
SIDE TRACK SWITCHES			Number	Equivalent Miles	Men per Mile		Number	Equivalent Miles	Men per Mile	
Side Track Switches		C'	96	4.8	1.5	7.2			0.5	2.4
SWITCH LAMPS:—				Allowance per Lamp	Men			Allowance per Lamp	Men	
Long Time			197	.01	2.0			.01		
One Day			93	.03	2.8			.03		
Total			290			4.8				4.8
CLEANING TRACKS—IMPORTANT YARDS		M	Miles	Men per Mile			Miles	Men per Mile		
Lebanon Junction			12	0.1	1.2					
Total						1.2				1.2
UNUSUAL WORK CHARGED TO MAN ALLOWANCE										
Tunnel watchmen						2.0				
Total						2.0				
Grand Total						254.8				211.6
RECOMMENDED ALLOWANCE COMING YEAR						255.				212.
ALLOWANCE PRESENT YEAR						210				

A—To be figured at 85% of the requirements for first main track.

B—Entry S=P(R)(.06.

C—20 Switches=1 additional mile of main track.

C—20 Switches=1 additional mile of heavy movement sidetrack.

D—17 Switches=1 additional mile of main track.

E 15 Crossings=1 additional mile of main track.

F—10 Crossings=1 additional mile of main track.

G—50 Crossings=1 additional mile of main track.

H—11 Crossings=1 additional mile of main track.

For paved or planked crossings in excess of 36 ft. in length, each additional 36 ft. to count as 1 additional crossing.

J—Passing, drill and ladder tracks.

K—House or other tracks switched two or more times per day.

L—Tracks not switched as often as twice per day.

M—Give number of miles of track in each yard and number of men per mile of such track required to keep yard clean. Include main track mileage in yard mileage.

_____Roadmaster.

A Man Allowance Chart on the Louisville & Nashville

A Chart for Determining the Man Allowance

A PRACTICAL method for determining the allowance and distribution of track maintenance forces, based in part on the determination of equivalent mileage, is illustrated in the accompanying chart which is in use on the Louisville & Nashville. The information on the form originates with the division roadmaster, who fills out the blanks to the left of the double-ruled line. It is then sent to the chief engineer's office where the roadmaster's figures are reviewed and the same or revised figures entered in the column to the right of the ruling. These revised estimates then serve as the basis for the force allowance recommended to the management.

The first items in the table are for first and second main track, several lines being allowed to permit of variations in the allowance for various stretches of track. This is followed by spaces covering automatic block territory, switches and crossings, side tracks, side track switches, switch lamps and yards. Side tracks are handled the same as main tracks, the roadmaster preparing his estimate of the allowance of men per mile of track, the tracks being divided into three classifications, namely, heavy movement, medium movement and light movement.

Switches, signals, crossings, etc., are handled on the basis of equivalent mileage, information at the bottom of the chart indicating how this shall be calculated, where instructions are also given the roadmaster from which he can classify the side tracks under three headings: heavy, medium and light.

Getting the Message Across.

How to Reduce Deaths and Injuries Among Maintenance Forces

Railway Safety Officers Diagnose the Problem and Make Numerous Suggestions at Annual Meeting

WHATEVER the facts are with reference to the attitude generally taken towards safety work on railroads in year past, it is becoming more widely and fully appreciated every day in the maintenance of way department as well as among shop and train forces, that accident prevention work is highly important in view of the number of deaths and injuries that occur each year from wholly needless causes, and also that safety work, like the work of maintaining track or other specialized branches of railway enterprise, to be effective, requires a thorough understanding of the problems involved and a recognition of certain principles to be followed in meeting them. In the May, 1924, issue of *Railway Engineering and Maintenance,* a large collection of statistics derived from the accident reports of the Interstate Commerce Commission was published which leaves no doubt about the presence of an accident problem of proportions in this department. This information is of assistance also in determining the nature of this problem. But no attention was given there to the manner of meeting it. In the following columns there appear abstracts of several papers presented at the annual meeting of the Safety Section of the American Railway Association held at Salt Lake City on June 24, 25 and 26, in which the maintenance officer's problems received special attention and numerous practical suggestions were offered to reduce the toll of accidents among maintenance employees.

Accidents to Track, Bridge and Building Men from Handling Material

By Robert Scott

Director of Insurance and Safety, Atlantic Coast Line, Wilmington, N. C.

Our officers and employees should be impressed with the fact that there is an element of danger in handling material. It should be kept in mind by foremen and workers alike that there is a never-ending stream of material passing through their hands, and that the utmost care must be exercised if they are to escape personal injury.

Men are often careless and thoughtless, although they know full well that what they are about to do is dangerous and may cause them bodily injury. They grow to have a contempt for hazards with which they are familiar in their everyday work. If one of these men should meet with a cold blooded proposal to surrender a hand or leg, for instance, for the privilege of doing a certain thing with it exactly one hundred times, he would not consider it for a moment. Yet he will stake that right hand in a sort of game, in which, though the odds are in his favor, he is bound to lose if he plays long enough.

The careless man looks out through the windows of his eyes and watches the procession of life go by, and as he does so he agrees that statistics apply to this external living stream, but he does not realize, and is scarcely willing to admit that he is a part of that stream. He doesn't really say, "This thing will never happen to me," but that is his state of mind.

Clean Premises Inspire Safety

Most of the fatalities to employees among track, bridge and building men are due to a failure to clear running tracks; working on the tracks without keeping a sharp lookout for approaching engines or cars, and jumping on and off moving trains. On the other hand many injuries occur among this class of employees simply because these men are not firm in their grip or sure of their footing. These two things are essential to safety, especially if the material handled is either heavy or bulky.

It is a fact that clean and well kept storehouses, yards and premises are conducive to safety and such an envi-

ronment should always be encouraged. This not only makes for safer conditions, but carries with it, through the power of suggestion, sane practice on the part of workmen around these premises. It is highly important that special care be used when handling ties, rail or other heavy material, and workmen should have an understanding with one another as to how the work will be done in order to prevent confusion and injury which may result therefrom.

Foremen Should Be on Safety Committees

Safety will not prevail among track, bridge and building men until such a time as a whole-hearted intelligent educational campaign has been conducted throughout the entire construction and maintenance of way forces, starting with the highest officer and leading on to the water-boy. We must by all means educate our bridge foremen and section foremen in their relation to the safety movement, along with the proper education of their men. These bridge foremen and section foremen are today highly trained specialists, and we must get them to understand their responsibility; must drill into them that upon their thoughts and upon their action, and upon the education of their men, depend not only efficient work but the safety movement as well.

There is no better way of accomplishing this than by placing these men on our safety committees and thus secure their interest in the work of preventing personal injury. After several years of studying this subject I have reached the conclusion that the foreman is the determining factor in safety, since the workmen's attitude toward safety depends on the attitude of the foreman. If he is indifferent the men will be indifferent. But if he believes in safety, if by what he says and does each day he convinces his men that he is in earnest and is doing everything to protect them, the foreman will get his men with him.

In giving consideration to preventing accidents among track, bridge and building men it is proper to touch upon the qualifications of the foreman since it is almost generally admitted that he is the key to the situation. First, he must believe in accident prevention just as he believes in anything else that prevents waste and increases the efficiency of his department. Second, he must care for his men as human beings, be sincerely interested in their welfare, and feel his moral responsibility to protect them. He must be a leader, capable of winning the confidence of his men, so they will pull with him. He must also know safety—must inform himself, with the assistance of the safety supervisor, regarding the best standards and practices developed on other roads where conditions are not dissimilar.

Further, a foreman must be on the square with his men, and must be appreciative of every effort or suggestion they make. And he must show his appreciation. In other words, he must win his men for safety. The foreman must carefully and constantly interest his men, especially the new men; not simply telling them to "be careful," but warning them in regard to the particular hazards of their jobs and giving specific directions as to safe methods of work. A foreman can take a new man and in a few minutes, if he has tact and a friendly attitude, can impress that man that here is a place where everybody is pulling together to keep people from being injured.

Safety Supervisor Important Factor

Another important factor is the safety supervisor. If the safety supervisor secures the wholehearted support of the foreman he will succeed; if not, he will certainly fail, and nothing can save him. How can the supervisor secure this support? First, he must be a "regular fellow"—the kind of a man the foremen instinctively respect. Second, he must win by the service he renders. If done in the right spirit, this is bound to win. The supervisor must keep in intimate touch with the foreman, discuss their accidents, and offer helpful suggestions based upon information gained at other points on the road, pertaining to production and working conditions, as well as accident prevention. At the very outset, the supervisor should present safety as a business proposition to the foreman—not a frill, but an indispensable part of an efficient organization. Foreman are not unlike all the rest of us. They resent any attempt to impose arbitrary standards; they appreciate being consulted from the start, and respond to recognition and courtesy. Therefore, the supervisor cannot afford to leave the foreman out of consideration.

The Foreman's Protection of His Men

By M. McKernan
Superintendent of Safety, Missouri Pacific

In considering this subject, it must be remembered that Safety First is a matter of education and education is a matter of leadership. It is easy to define the duties of section and bridge and building foremen, but in doing so, we must appreciate that unless division engineers, roadmasters and other higher officers have the proper idea of the relative value of safety to efficient railroading, the problem of getting the foremen in line is difficult. When supervising employees can be made to know that Safety is first, not only in theory but in practice, and that their superior officers are closely in touch with the labor and material used and the many other complex phases of railroad operation, then you will find that the words "accident prevention" mean something. Human nature does not change. Men, after all, are only grown up boys and all the lectures, bulletins and endless sermonizing will not make the impression that will be made by a manifestation of interest in safety rules from superior officers and evidence of determination on the part of superior officers that rules must be observed.

A Few Words a Day to Keep Accidents Away

The foremen who have been most successful in accident prevention are those who take a few minutes at the start of each day's work for a brief talk on safety and for a word of caution to their men to act safely and avoid injury to themselves or their fellow workmen during that day. "No accident" months have been advertised and exploited, but if we can first get foremen and their men to look on each day as a "no-accident day" we are going to get nearer to the fundamentals of the accident question.

First of all the foreman should impress his men with the importance of safety to themselves and the importance of their safety to their families. A man whose mind is filled with affection for his wife and children and whose actions are guided by thoughts of their welfare is less likely to run the risks of foolish and unnecessary hazards that are resulting in so many personal injuries on American railroads day after day.

The foreman should, of course, see that the work is so outlined that men receive ample notice of the approach of trains in time for them to reach a place of safety. If on double track, they should be trained to watch for trains which may approach at any time running with or against the current of traffic.

One of the most prolific causes of injuries on the section and in bridge and building gangs is in the handling

of material. Unless men are properly trained in handling ties, rails and other heavy material, there is always danger of injury. Too much stress cannot be laid upon this subject and upon the importance of training men in coordinating their efforts when handling heavy material. It should be unnecessary to enumerate the many important operating and maintenance of way rules that have a direct bearing on safety, but if we are to have safety first foremen, they must have a thorough knowledge of the book of transportation rules and of safety rules, concerning the operation of trains and protection against trains in doing their work.

Faulty Line-Up of Trains Dangerous

Next to handling material, the operation of motor cars is one of the greatest hazards to overcome with section and bridge and building foremen. Like some automobile drivers, the motor car operator often develops the speed mania and becomes reckless in the operation of his motor car. High speed on motor cars is neither conducive to safety nor will it permit the section foreman to inspect his track properly. If these men are to be safe, the operation of motor cars must be closely checked and every motor car accident must have a formal investigation the same as train accidents and must be advertised so that other foremen may see the results of unsafe operation. One of the most flagrant causes of motor car accidents is the practice of operating motor cars without securing a line-up of trains or by accepting a line-up that is incorrectly and carelessly worded. Another is the failure to flag around curves and other obscure places, as well as the lack of care in operating cars over crossings where there is a possibility of collision with passing vehicles or where there is a liability of derailments due to dirt or stones on the rails. It has been frequently suggested that railroads should require all motor cars to stop before passing over highway crossings and the adoption of some such rule should be given careful consideration.

Next in importance is the matter of unsafe or defective tools. A periodical examination of tools should be made by the foreman, and occasional checks should be made by the roadmaster and supervisor. Foremen must give their men to understand that they are expected to know that the machinery and tools they are to use are in proper condition and safe for service before using them. Railroads do not expect their employees to incur any risks whatever from which by the exercise of their own judgment and personal care they can protect themselves and foremen should enjoin their men to take time to perform their duties in safety whether or not they may, at the time, be acting under the immediate orders of the foreman.

Foremen should also instruct their men as to the necessity for the proper handling of switches. An open or unlocked switch not only is a hazard to the workmen themselves but to trainmen and passengers. Every man in the gang should be brought to appreciate that lives may be lost through some thoughtless act of his and if the foreman can be educated to the proper mental attitude on the subject of safety, there is no question but that his men will follow in his footsteps.

Too often the section and bridge and building men are not considered in the formation of our safety committees. We have tried to overcome this on the Missouri Pacific by holding maintenance of way safety meetings, where not only the foremen but the men under them are brought in and some division or general officer talks to them about accidents, their causes and methods of preventing.

Foremen should see that their men are supplied with drinking water at all times that is known to be free from contamination. When drinking water that is known to be contaminated must be used, it should be boiled before using, or if facilities for boiling are not available any water may be made reasonably safe by the use of one drop of iodin to a gallon of water. Foremen should understand and must be responsible for sanitary conditions surrounding camps and cars in which men eat and live. Foremen in low-lying countries should understand fully what is involved in anti-mosquito campaigns for the prevention of malaria, which in the past has been the cause of a great lack of efficiency in labor in southern territories.

If the foremen can be made to get a true conception of their duties and their responsibility of leadership, we will have performed the biggest task that we have in the problem of protection for the men under them. Experience is the best teacher, but the men who learn most quickly are the ones who can profit by the experience of others, rather than by their own experience, which frequently is costly, and comes too suddenly to save their life or the lives of others.

Motor Car Accidents, Their Causes and Prevention

By J. D. White

Chairman, Safety Committee, Illinois Central, Chicago

Approximately 1,700 motor cars are in service in the maintenance of way structures department of the Illinois Central. The most common causes of accidents arising in connection with the use of these cars in the order of their importance are as follows:

Derailments, due to running into open switches and other causes.

Boarding or alighting from cars.
Lifting on or off track.
Falling from cars.
Collisions with trains, automobiles and other motor cars.

Speed is a contributing factor in two of these groups. Perhaps excessive speed in the use of motor cars can be largely attributed to that human instinct which may be described as an almost uncontrollable passion to utilize to the utmost all power and authority invested in the individual.

Derailments chargeable to nearly all causes can be ascribed to inattention on the part of foreman not watching the track, therefore, any kind of an accident may occur. If cars are run at a safe speed and a sharp lookout is kept on the track and rails it is seldom that a derailment will occur before car can be brought under control. The rules provide for running particularly slowly over frogs, switches, road crossings and other points where derailments are most likely to occur. Injuries from getting on or off motor cars, putting cars on or taking them off the track, and falling from cars are largely due to the carelessness of the individuals concerned.

No Excuse for Collisions

Collisions of motor cars with trains can only be ascribed to carelessness on the part of foremen, as the rules charge the foreman with the duty of securing necessary information from train dispatchers, and if telephone information is not available, the rules further provide precautionary measures.

Loose wheels on motor cars and other car defects sometimes are the cause of accidents. It is more than probable that loose wheels or other defects in the car

did not occur just before the accident and proper inspection before starting would have prevented the accident.

Another careless factor in a large per cent of motor car accidents is manifested in disorderly crowding and seating of men, hasty and thoughtless loading of tools, inattention to car and contents while under way and disregard of the danger of imperfect flag protection.

We have found that as the experience of the men riding motor cars increases, the number of accidents decreases materially. This is a condition, however, that may be reversed temporarily by some unusual accident, but it is true that as the men who operate the motor cars become more experienced, greater care is generally exercised.

Most of the rules for the operation of motor cars are designed to prevent accidents on the Illinois Central and no one is permitted to operate motor cars until he has passed a satisfactory examination on the rules.

The Remedies for Motor Car Accidents

Broadly speaking, the remedies for motor car accidents are as follows: Supervising officers should be charged with the direct duty of impressing motor car operators that they must comply strictly with all rules governing the operation of motor cars, and to follow a persistent campaign of safety education. The foreman must be made to realize fully he is held strictly responsible for the safe operation of his motor car and the safety of the men under him. The only absolute cure for excessive speed in the use of motor cars is to render high speed impossible in the design of cars, but as there are objections to limitations of this kind, the speed should be limited to 15 miles per hour, while the cars should not be run over 6 miles per hour over frogs, switches, crossings, interlockers and through stations, and should be stopped where an unobstructed view of at least 200 ft. cannot be had in both directions from highway or street crossings.

The unsystematic loading of men and tools, which is primarily due to failure of supervision on the part of the foreman, should be corrected. Two men are enough to start a car and these men should be designated and required to sit in the rear to do the starting. The men should be prohibited from getting on moving cars from either the front or sides.

Make the Foremen Responsible

The foreman should be charged with the responsibility of keeping his car clean and all bolts tight and of inspecting the car before starting. He should appoint two men of the gang to ride in designated places, one to look forward and the other backward, on the alert for approaching trains, animals on the track, rocks, sticks and other obstructions on the rails and in crossings and for open switches. The foreman should have a full understanding as to what part each man will take in handling the car and the side of the track to which the car will be removed, if an emergency should arise necessitating prompt action. All cars should be equipped with safety hand rails or grab irons to keep men from falling off. Also a screen or strip should be in place on the front end of every car to prevent tools from working forward and falling in front of the wheels.

Supervisors should examine the foremen on the time table as to movements of trains, and the time due at stations, and instruct them as to keeping posted on train movements, proper and complete flagging equipment and the correct way to flag trains. Finally, education is the only solution for the prevention of accidents. Men must be taught to think, be careful, and carry out rules and instructions.

Reclamation of Scrap Pays on Southern Pacific*

THROUGH accumulation and reclamation of used materials a saving of $2,531,878 was made during 1923 on the Pacific System of the Southern Pacific, according to a report made recently by A. S. McKelligon, general storekeeper. Out of the accumulation of scrap gathered in by supply trains from all points on the system, $612,955 was saved through reclamation work. The company sold 51,665 tons of scrap during the year for $665,584 and itself used 58,245 tons valued at $1,253,339. The statement for 1923 follows:

SAVING BY RECLAMATION

Value of reclaimed materials if purchased new		$ 970,139.18
Scrap value	$ 17,758.55	
Reclamation costs	339,425.31	
Total cost		357,183.86
Saving effected		$ 612,955.32

SCRAP ACCUMULATION

Scrap sold, 51,665 tons for	665,584.12
Scrap used in industries, 58,245 tons, value	1,253,339.28
Total saving	$2,531,878.72

This statement is exclusive of savings effected by conservation and other economies such as manufacturing of useful articles from worn out or discarded materials. No record is kept of such savings.

Among the scrap material sold were empty cement sacks for which credit of $31,094.04 was obtained; scrap wood sold to employees and others for $8,879.54, scrap cross ties sold to employees for $8,602.94, and scrap paper sold for $2,336.

Reclamation is considered as scrap entirely rebuilt into usable material. The rebuilding of switch points, frogs, etc., by the acetylene welding torch is an example of this practice. The reports show the following results of these operations for 1923:

Switch points, 1219, savings effected	$20,255.10
Frogs, 135, savings effected	8,355.37

Repairing 10,904 track shovels by inserting new handles or welding blades netted a saving of $7,368.90. Reclaiming 2,585 track wrenches saved $2,360. Reclaiming 470,000 scrap track spikes saved $8,235.

A great deal of material was taken from scrap piles, cleaned and renovated and placed back in stock. Among this material was the following:

Rail joints	19,150	$28,000
Tie plates	32,000	3,500
Lumber	615,000 ft. bm.	18,000

Further economy was effected by many practices in daily use for making material, discarded by one department or service, usable for others. These practices include the making of oil storage tanks from old boilers. The cost of this work averages $50 for each tank while the cost of new tanks averages $200 each, effecting a total saving of $1,747.20. Old paint brushes are received from painting jobs through the practice of exchanging new tools for old. Those satisfactory for rough work are used for painting castings, track material, locomotive front ends, etc. The handles of unusable brushes are saved and sold to manufacturers. The saving from this work in 1923 was $297. Scrap rope received with shipments delivered to the company in packages, bundles and sacks was re-used, with an estimated saving of $4,118.

Old five-gallon cans brought in by supply trains to district stores were repaired by electric soldering irons and re-used, affording a saving of $4,903.23.

*From Southern Pacific Magazine, June, 1924.

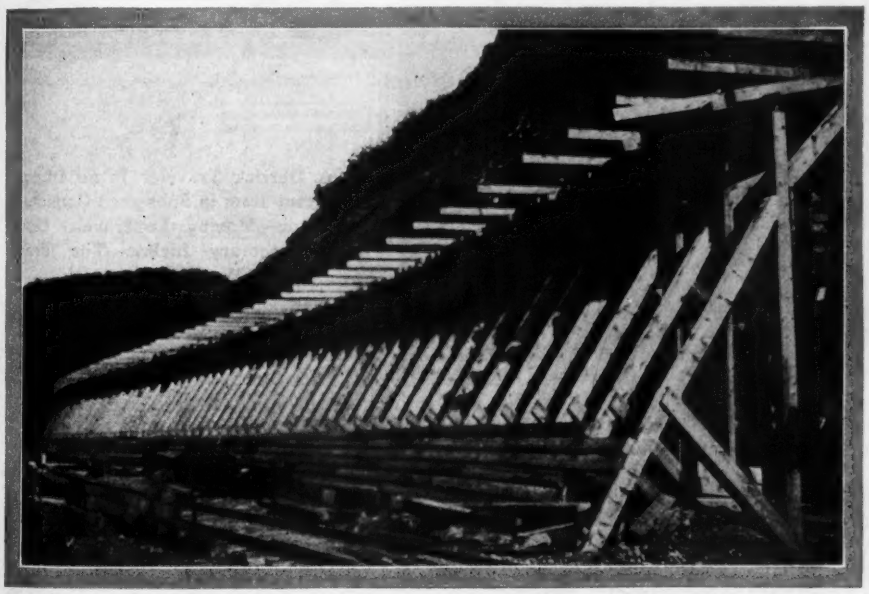
Snow and Snowshed Problems in Alaska

Construction Practices on the Government Railroad, Described by a Member of the Bridge and Building Forces

By WALDEMAR ENGBERG

A Rotary Plow Cut on the Alaska Railway.

ALASKA is a country of enormous area and great reaches and necessarily has a diversified climate. In a sense, one might place Alaska under several classifications that are directly opposed to each other. For instance, one may call it frozen Alaska because the largest part of it is frozen solid the year round from a few feet under the surface to unknown depths. Then there is a large area which one might call unfrozen Alaska because it is frozen only to a very shallow depth during a small portion of the winter. One might also call it wet Alaska and dry Alaska because in some portions the precipitation is very great, while in other portions the climate is very dry the year round. There is warm Alaska, where the temperature the year round will average the same as Virginia, and there is cold Alaska, where the thermometer will drop as low as from 60 deg. to 80 deg. below zero.



The Construction of Snowsheds Requires an Enormous Quantity of Lumber

These conditions naturally affect railroad building to a great extent and present problems that are not usually encountered where conditions are more normal. In putting in foundations for a bridge, for instance, the presence of hundreds of feet of frozen ground underneath becomes a serious problem. Piles driven for a trestle, where thawing with steam points has to be resorted to for every pile, have sometimes had to be torn out because of the continual heaving. In another place the problem may be of an exactly opposite nature. In some portions of Alaska there is a great deal of snow, while in other parts there is hardly enough snow to enable fuel and meat to be hauled in on the sleds so generally used.

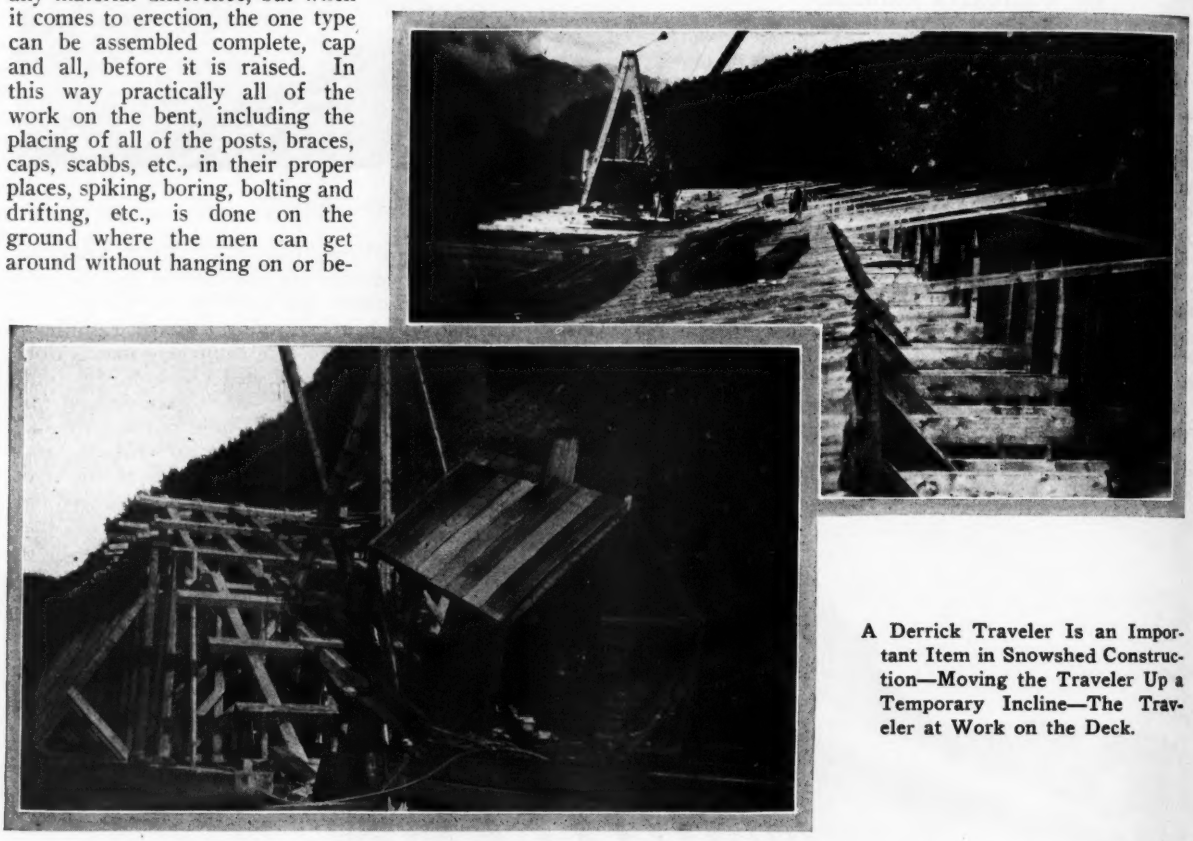
The Alaska railroad runs through a country where almost all of these conditions are encountered and the solving of the snow problem has been one of the greatest tasks. Of course, when pioneering a railroad one cannot expect to have the up-to-date equipment that is to be had on the old and long established railroads, especially the large roads in the "states." So it may be said that on the old Alaska Central, the 71-mile railroad running from Seward which the government took over, the snow problem was probably the most serious. The old road operated rotary snow plows that were probably as large as it could handle, but when it came to tunneling through some of the massive slides, there was nothing to do but wait until summer and let the sun do the work.

For several years after the government began construction, snow still presented the greatest problem of the winter season; in fact it was so serious that operation was often interrupted between Anchorage and Seward. In 1919, the first snowsheds were built where some of the heaviest slides occurred. But many other sheds had to be erected before the road could finally operate through the whole winter. In the meantime, rotary plows of larger size were procured, so that between them and the continually growing mileage of snowsheds the road has been able to maintain a regular transportation service for the last three years.

In constructing these sheds one factor which had to be taken into consideration was the material available. The native Alaska spruce which was used possesses strength and durability which will average about 50 per cent of that of Douglas fir. Nevertheless, it has stood the test remarkably well. To obtain this service it is necessary, of course, to increase the size of members over what would be required with Douglas fir. The same is true also in bridges, where there has to be a surplus of strength to take care of the normal deterioration in the material.

Two different designs were used, which differed chiefly in the direction of the caps. This also affected the lay of the roof. In one type the caps are parallel with the track or perpendicular to the bents and in this construction the roofing is laid in line with the bents or running up into the hill. In the other type, the caps are laid lengthwise with the bents, crossing over the track, in which case the roofing is laid lengthwise with the shed, with a top layer running up hill.

As far as the framing is concerned, this does not make any material difference, but when it comes to erection, the one type can be assembled complete, cap and all, before it is raised. In this way practically all of the work on the bent, including the placing of all of the posts, braces, caps, scabbs, etc., in their proper places, spiking, boring, bolting and drifting, etc., is done on the ground where the men can get around without hanging on or being in danger of falling. Then the whole bent is raised, and it is only a minute's work to plumb it up and secure it.



A Derrick Traveler Is an Important Item in Snowshed Construction—Moving the Traveler Up a Temporary Incline—The Traveler at Work on the Deck.

When the other plan is used it is necessary to set up one post at a time while men are hanging on at different places to plumb and make them fast. Nearly every post requires an individual stay brace. After a certain number of posts are up, the work of putting the permanent braces begins and that is a job for an Alpine climber. The men must climb from place to place with a hammer and spikes and sometimes have to provide special staging to work from.

Several bents must be erected in this manner before the caps for the different lines of posts can be put in place. Then the decking is laid up to the first place where the caps break joints. After this, the hoist pulls ahead for another section. With this plan a great deal of the boring and bolting has to be left until after erection, which could otherwise have been done on the ground.

Snowshed work is usually a big job and should be laid out as far as possible for quantity production. No kind of construction offers a better opportunity for systematic organization. By attention to this feature of the work a contractor on some of the snowshed work was able to get the same amount of framing done by four men that was previously done by eight men. Templates were worked out for every detail, not only for cutting but also for boring and no time was lost in the silent game of waiting. This contractor also utilized other efficient means of saving time and labor. For instance, although there were only a few air compressors in Alaska at that time, he managed to get hold of an old locomotive compressor, which he attached in front of his hoist donkey and with the help of a pipe line provided himself a very efficient air service without any additional expense. It was afterwards estimated that this rig alone saved him $1,200 on a job of a million and a quarter feet over the "Armstrong" method. Besides saving a great amount of labor, boring with air is more accurate and that is of importance in framing knock-down timber for if the holes

A Snowshed As Seen From Above, High Temporary Trestle in Background

do not match it would be better if they were not bored.

Experience on these snowsheds points to the advantage of having the derrick rigged up properly for such work. An A-frame derrick on driver runners has proved the best. If it is so arranged that the A-frame is about 10 ft. back from the end of the runner, it offers a good platform to work from and to keep the tools that are needed ahead.

The surcharge on the sheds in Alaska is about two yards to the running foot. There is always plenty of rain in the fall of the year, so that when the freezeup comes the surcharge becomes a solid mass which offers good protection to the shed. The shed conforms to standard practice for timber sheds. It has mud blocks, sills and cross sills, posts, buck, knee, sway and crossbraces, caps, etc., similar to other snowshed construction. The clearance from top of rail is 23 ft. with 17 ft. 6 in. between track posts. More sheds are needed to eliminate tie-ups, which sometimes last for a day or two and there is usually enough to do to keep the rotaries and the Russels pretty busy all winter.

How the Kansas City Southern Drains Water Pockets

THE Kansas City Southern has for many years been troubled with short stretches of soft roadbed throughout virtually its entire length. These soft spots have been due partly to the geological formation of the soil and partly to heavy traffic and ineffective drainage, and during the earlier years of the road's existence to insufficient ballast.

On account of extensive grade revisions and line changes which were completed about ten years ago, there is a large percentage of comparatively new cuts and fills, about evenly distributed over the entire line. It is principally on these stretches where line changes have been made that "squeezes" occur. However, occasionally they

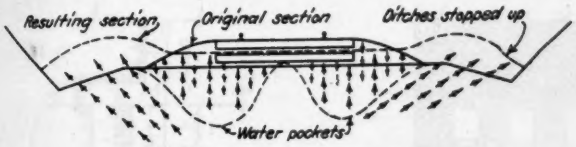


Fig. 1—Typical Action in Soft Roadbed

manifest themselves in seasoned roadbed. To maintain good surface on old roadbed saturated with water is difficult, and with new roadbed it is almost an impossibility, especially under the pounding of heavy traffic.

The territory from Grandview, Mo. (23 miles south of Kansas City) to Pittsburg, Kansas (130 miles south of Kansas City), is underlaid with a deep stratum known as "gumbo," a partially decomposed shale. In cuts through this material it slacks on being exposed to the elements and trouble is caused by the sides of the cuts caving in and stopping up the ditches. This material is not easily drained, even under the most favorable circumstances, and under heavy and frequent traffic it pulverizes, and with water forms a paste which obstructs even the natural percolation through it and results in the forming of almost water-tight pockets which fill with water and must be drained before the track can be kept in either line or surface.

One of the common track conditions that occurs in certain water-holding soils on the Kansas City Southern is shown in a general way in Fig. 1. The full lines represent the section of roadbed as originally built, while the dotted lines show the resulting section after the water pocket in the roadbed has been formed. The movement of materials is represented in a general way by the small arrows.

It has been found that ballast applied at a point where a water pocket of this nature exists does little if any good so far as the purpose for which it is intended is concerned, as it virtually sinks into the plastic material, while the lateral and vertical movement of the soil eventually makes the water pocket larger and therefore more difficult to overcome. Pockets or "squeezes" of this kind are a constant source of trouble for the maintenance of way department. They are frequently no longer than one rail-length, although some are much longer and many extend over several hundred feet. The depth to which the track may sink is sometimes eight or ten inches. When a condition of this nature develops it becomes almost impossible to hold the track surface for a twenty-four hour period without resurfacing, and during wet seasons two or three such spots will easily consume the entire time of a section gang.

An extensive study has been made of methods for eliminating these spots, and each year new methods are found to be effective in given places. A method of tile drainage was first tried out. Under this plan tile 6 in. in diameter was laid in a V-shaped trough constructed of two plank 2 in. by 8 in., laid to a carefully established grade line, with a minimum fall of three feet in one hundred feet; a tile line being placed in the roadbed immediately beyond the end of the ties and at such depth as necessary to place it below the material disturbed or in movement. After the tile was placed cinders were used for backfilling so as to permit the percolation of water to the tile. In the first of this work carried out farm tile was used, later being supplemented with bell-end tile, but in neither case were the installations satisfactory.

The second method tried was that of driving sheet

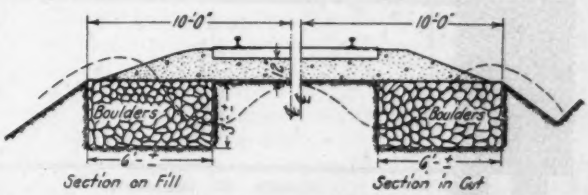


Fig. 2—How Water Pockets Are Cured

piling in parallel rows on each side of the track. The sheet piling used was of oak, 6 in. by 12 in. by 9 ft., driven by a track driver, with the tops six inches below base of rail and at a distance of about one foot beyond the end of the ties. This method was found to be very expensive and the results were rather doubtful.

The method which has been found most effective under all conditions consists of two parallel trenches, three feet or more in depth and six feet or more in width, dug beyond the end of the ties and filled with heavy boulders ranging in size from ballast to one-man stone. This system of sub-grade drainage is illustrated in Fig. 2. It has been found that this method overcomes the soft roadbed condition by affording drainage for the water and

adding sufficient weight to provide lateral bracing to the roadbed.

Another plan which has been tried out consists of placing rows of tile in the extreme back edge of the ditch, below any possible point of disturbance, and laying rock cross-drains to this tile to take care of any soft spots under the immediate track structure. The introduction of the drainage from the rock drains into the tile is through T-joints placed at sufficient intervals to take care of water pockets. This method has been found to be effective in most locations and is less expensive than parallel rock drains, which often require long trenches to give drainage outlets.

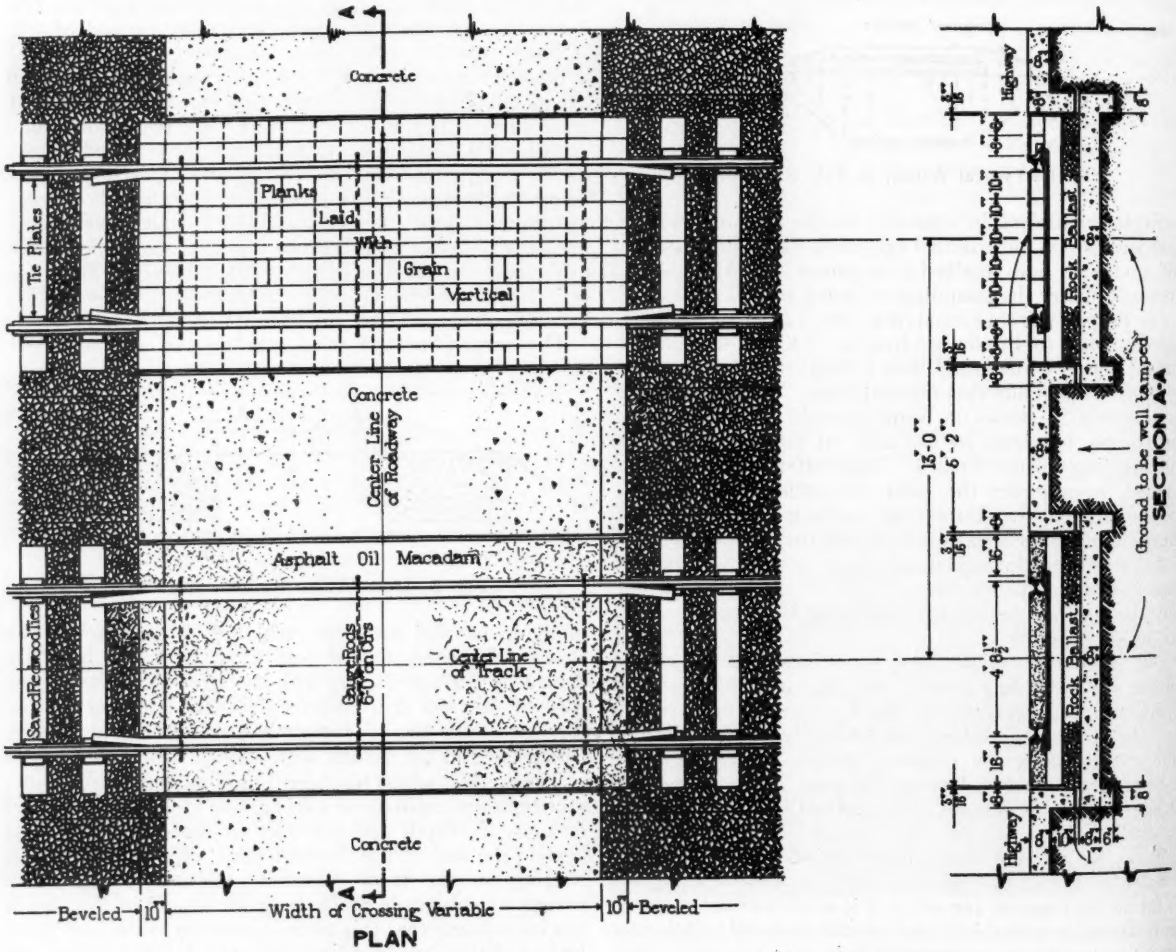
We are indebted for this information to A. N. Reece, chief engineer of the Kansas City Southern, under whose direction these studies have been made.

Highway Crossing Design on the Southern Pacific

THE Southern Pacific has developed a standard design for highway grade crossings for both asphalt macadam and plank paving which is unusually complete, both as to details of construction and instructions for carrying out the work. Although the design provides for the use of either timber or asphalt macadam for the pavement directly over the ties, an eight-inch concrete pavement is provided outside the track to a junction with the end of the pavement in the street or highway as well as in the space between tracks. This concrete pavement terminates at the ends of the ties in an inverted concrete curb or cut off wall extending to a depth of 18 in. below top of rail, the two curbs on either side of the track thus forming a trough or channel to receive the standard ballasted track construction. Where soil conditions demand, a concrete or timber mat eight inches thick is provided to afford more stable foundation for the track and to prevent soft material in the roadbed from fouling the ballast. This mat is made wide enough to extend to the outside edges of the two curb walls and has its top surface depressed one inch below the bottoms of the curb walls to afford adequate drainage for the ballast.

The construction of the crossing according to this design implies the use of new ballast and the renewal of all ties with sawed redwood or cedar, fully tie plated, and the installation of gage rods at intervals of six feet. The crossing is also equipped with steel flangeways consisting of rail laid with the ball against the web of the running rail and bent to give a slight flare at each end beyond the edges of the pavement.

The plank crossing is made of edge grain cedar or fir planks 10 in. wide and of a thickness that will bring the top of the plank ¼ in. lower than the top of rail. In place of these 10-in. planks, planks cut from sound second-hand stringers may be used. All timber except cedar is treated by boiling in crude oil. The planks are secured in place by lag screws or spikes in every second tie. After the planks are installed, the joints are poured with hot Roadomite oil or asphaltum. The top surface



Details of the Plank and Asphalt Macadam Crossings

is covered with a coating consisting of 3/8 in. of stone screens well mixed with Roadomite or other heavy oil. The construction of the macadam crossings is shown in the drawing. We are indebted to W. H. Kirkbride, engineer maintenance of way and structures, Southern Pacific, Pacific System, for the above information.

The Foreman As a Traffic Solicitor

By James Sweeney
Supervisor, Chicago & Eastern Illinois, Danville, Ill.

ONE DAY early last fall a clerk in a general store and a section foreman had partially filled the section foreman's more or less automobile with their families and gone to spend Sunday with a farmer. The men were related, not so closely as to strain their friendship but merely enough to be a little more than ordinary friends.

Libraries have been written about the hospitality of our dwellers in the country and nothing that I could write would add to the scene. The women in the kitchen, the children playing in the yard, the men visiting on the porch, no matter how occupied, just looked forward to dinner. And when the dinner is served it is eaten not as a necessary measure to sustain life, but as a feast at which life-long friendships are renewed and repledged in a spirit of hospitality extended and accepted. Business men everywhere are striving to establish the same relations in dining rooms where the silver service alone is worth more, in mere money, than the farmer's whole house, yet they somehow fall just a little short. Why they fail, I do not know. Perhaps the guests do not have the appetites that these guests had; for they did eat. They ate until it was a case of walk or go to sleep.

The right kind of farmer will feed the right kind of man any day in the year and think nothing of it, but when this same farmer offers to take one out to see his hogs after he has eaten, and he goes, the friendship is cemented in bonds that will never be entirely broken. It was out to the hog lot that our three friends walked in their stupor from intemperate eating. A great drove of thoroughbreds that, to the practical eye of the section foreman, would easily fill two cars.

The clerk in the general store immediately fell into conversation with the farmer as to feeds, telling him of the experience of other hog raisers in the community with feeds of various kinds. It so happened that one particular feed had given such success that his employer had only that week received a full car load. As they walked around over the farm they continued to discuss the results of special feeding and the farmer decided to go to town the next day to secure a supply of the new feed.

During the whole time the section foreman remained silent and listened to their talk. He realized that the clerk was endeavoring to sell something, not necessarily to secure the other man's money, but because he had something the other man needed, and which, if used in his business, would work to his advantage. There appeared to be no violation of their friendship in the clerk's action, any more than if the section foreman, who knew that it would be to the advantage of the farmer to ship those hogs over his railroad, were to tell him that advantage, both as a representative of the road and as a friend. As the afternoon wore on the thought of those two car loads of hogs never entirely left the foreman's mind and just before leaving he drew the farmer off to one side and said "Now, I have been thinking about those hogs of yours. When you get ready to ship them I will be glad to ask our agent to arrange cars for you."

That evening at home the foreman and his wife reviewed the day's happenings. In the course of their conversation she mentioned that Mr. Farmer had said that a neighbor, Mr. So-and-So, had sold his farm and was going to move to another state.

An alert traffic department had already provided for such events by preparing a postal card form for general distribution, in which any employee could notify his nearest traffic representative. It required but a moment to fill it out and this, the foreman did, while the subject was fresh in his mind. When this postal card form was mailed the entire resources of the traffic department were placed at the command of a prospective customer who had given no thought to what route he would travel in moving his family and personal belongings to a distant state. A correspondence clerk of more than ordinary ability wrote him a letter that was a work of art. All the customer needed to do was to fill out a numbered blank and insert it in a self-addressed, stamped envelope to secure all the consideration that could be given to the biggest shipper in the land. The agent was notified and he called on the 'phone to offer his services. The business was secured and the day set for the trip to begin. Railroad tickets for three adults and two half-fares together with sleeping car tickets were sent to the agent several days in advance. The car was on hand and the stock and household goods were loaded and went forward. The next day the fast train stopped at that station for the first time. The porter stepped down to the platform behind a smile seldom used except for royalty, to welcome these specially solicited customers into their first sleeping car. A waving of handkerchiefs to the friends on the platform, smiles through tears, a nod through the car window and the journey was begun.

The section foreman had happened to have some work that kept his gang around the station but no sooner had the train started than he called to his men, "Put the car on and we'll go down to the other end of the section." With the motor chugging regularly the oldest "hand" asked, without expecting an explanation, "Wonder how 99 came to stop for So-and-So's to get on," but almost fell off the car when the foreman answered in an off-hand way, "Oh! I arranged for that."

That evening on coming in from work the men found that the "ghost had walked" and, with their pay checks in their pockets, stopped to pay their grocery bills. There was some delay while the proprietor of the general store settled with the driver of a motor truck for about a ton of goods the latter had delivered as a part of his load from a city twenty-miles distant, the balance of the load to be delivered at other towns along the route. Out of his change, the driver bought a seven cent cigar and walked out.

The foreman waited for his men to pay their bills and watched each transaction completed with a gift of a bag of candy and a cigar. When his turn came he paid his bill and received the candy but when the merchant handed out the cigar box he waved it aside and went into action. With more force than logic he explained that the merchant had collected well over a hundred dollars that had

first been earned by the railroad by hauling freight. If the road had earned more by hauling all of the freight along the line that there was to haul, there would likely have been another man there paying his bill, but it hadn't, because a lot of merchants were having their freight hauled by motor trucks. He would probably have been talking yet but the merchant was a business man who could understand business talk, and he broke in "No., let me get this straight. Do I understand that you want me to ship all my goods over the railroad because you boys all work for it and if the road don't earn any money they can't pay you?"

"Yes, sir," said the section foreman, still mad, "that is exactly what I want you to understand. That's not all—."

"Now wait a minute," interrupted the merchant, "one thing at a time," and turning to the other section men, who were standing back taking in the fireworks display with open mouths, he asked: "Do all the rest of you boys feel the same way about this?"

They all did.

He replaced the box of cheap cigars in the case and got out an unopened box of the one kind he had marked two for 25 cents. Handing the box to the section foreman, he said "If you're real, these cigars are not good enough for you, and if it will be any satisfaction to you, I'll tell you now that so long as you feel the way you talk, I'll not even let the drivers of that truck line buy gasoline here. Now go on home before I wake up."

What I have tried to show is that the section foreman is simply human. He is not a traffic expert but he can transmit any information he may secure to the proper office where it can be acted on, if he is shown that there is a desire for the information and that it will be used when he furnishes it. He can connect his pay-day dollar with the dollar the agent takes in if it is kept before him, and when once he does get that connection well established in his mind, he can be depended on to keep it there and act on it. But when the last word is said on traffic solicitation by the section forces, or any other class of employees, we come back to the hard facts that to get more business is the problem of the traffic department. We may all stand ready to help as best we can, and I believe we all have an honest desire to help, but they must devise and inaugurate plans for accepting and using that help. Not just a little flash of effort now and then, but a patient, steady campaign covering a period of years in the end will mold every employee of any system into a force who will think of the company's business as their business.

A Foreman's Interest In His Own Community*

By P. Rouse

Section Foreman, Kansas City Southern, Poteau, Okla.

I HAVE often asked myself whether I take the interest in my community that I should. The answer has usually been that I do not. I think this same answer would be made by most foremen.

One of the things that we neglect to take an active interest in, is the work of the church. All of us should go to church with our families regularly, or as often as we can. A man is judged by the company he keeps; when he keeps good company he is generally classed as a good man, and it takes good men to make a good community. We can be as good men as the country has if we will only try, and I am sure the company we work for wants that kind of men, as we are in a sense their representatives in the communities in which we live. So let us be good ones.

We should live so that we will be solicited by the good citizens of our communities to join the different organizations and clubs working for the benefit of the individual and of the community, and after becoming members of these clubs and organizations we should be active members.

Do we take part in city affairs, vote at the city elections, and take an interest in seeing that good men get into office? If we do not take such an interest, we should. If we do, do we talk politics? We ought never to argue politics, for by doing this we might make an enemy as some people are radical over politics. I vote my way and if someone else doesn't see it just the way I do, I laugh it off with him, and leave him my friend.

Do we take an active interest in the schools of our community? This is very important. We should visit the schools, and especially on parents-and-teachers meeting days.

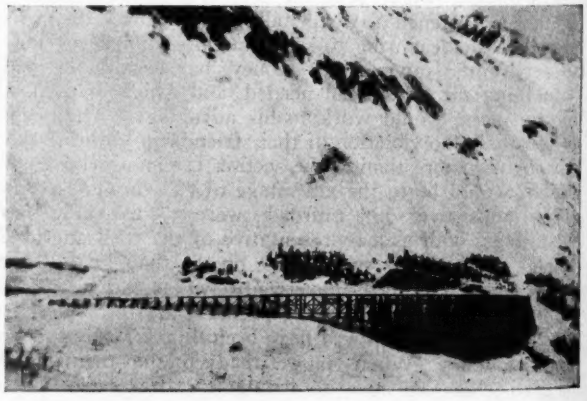
Are we boosters for our town? And when speaking of our town do we speak of the good things, or do we tell others all the bad things? I know of no better way to help kill a town than to run it down in conversation with people who don't live in your town. On the other hand, by speaking a good word for our towns we may be the cause of a person moving there from a town on some other road, and thus have him on our road. The more people on our road the more business for our road, and more business means a better road. So let us be boosters and not knockers.

Do we ever visit the Chamber of Commerce of our town while it is in session? We should do this, for by going there we learn what is going on in our town, and what the leading men of our town are doing or planning to do, and then we can fall in and assist all we can. They always appreciate anything we can do or say that will benefit our town.

Do we visit the city council when it meets? If not, we should, for by so doing we learn of the different city laws that are in effect or about to be passed, and if an ordinance passed is one that involves our company, and will cost it extra money that might be avoided, it is our duty to try and get it changed if we can. Many times we probably can get them to see it our way, and persuade them to make a change in a proposed law.

I consider all of the people who live in the neighborhood where my section runs, as neighbors, and treat them as such. And I have never yet failed to get along with them, though sometimes it has been hard to smile—but it pays to smile.

*Abstracted from a paper presented before the Kansas City Southern Maintenance of Way Association at Joplin, Mo., on May 3, 1924.



Horse Shoe Trestle at Mile 48 on the Alaska Railway

Lumber Standards on the Railways*

Tendency Towards Standardization of Sizes and Specifications and Discrepancies in Inspection Described

UNTIL the Department of Commerce in conjunction with the manufacturers of lumber agree upon standard sizes, railroads should purchase their requirements upon the commercial specifications regardless of the purpose for which they are intended, for the following reasons: First, as to grade, all lumber purchased and used by railroads today, regardless of species, grade, or purpose is covered by and included in specifications compiled and issued to the general trade by the various lumber associations from which the railroads through necessity procure their requirements. The commercial specification is the basis of all specifications now used by railroads insofar as grades are concerned. Secondly, as to sizes, it is impracticable to set up a schedule of standard sizes of lumber to be used by railroads in repairs to equipment until such equipment has been standardized.

The above does not refer, however, to dressed and matched lumber, which has been standardized and which standards are in universal use by all railroads, neither could a recommendation be made with regard to maintenance of way and structures, as the requirements of various roads are not the same, some requiring light bridge construction, while with others heavy types are necessary. Therefore, if the engineeers of both the motive power and maintenance of way departments would be consistent in specifying their needs, showing the actual sizes required for the purpose, no difficulty should be experienced by the purchasing and stores departments in procuring lumber of a satisfactory character by specifying commercial grades in all cases and actual sizes at all times.

The entire matter of grade depends upon the inspection given the lumber at the time of loading on cars or upon receipt at destination, by thoroughly competent railroad inspectors who have been trained in the interpretation of lumber specifications and can make inspections in accordance therewith. To permit the average yard, shop, or maintenance of way employee to inspect lumber is an economic waste and decidedly expensive to the railroad. This refers particularly to the small roads that do not have regular inspection force, and also to trunk lines where the inspection force is inadequate during rush periods.

Order Standard Sizes

In placing orders for board and plank stock, widths and lengths should be specified in standard cutting. Odd lengths and widths should not be ordered, except for some special use where standard sizes will not answer the purpose. As a rule, it is impracticable, therefore expensive, to order all boards or plank of one width or length, as a premium must be paid to procure any special assortment of widths and lengths.

Where pine and fir lumber are intended for preservative treatment before use, a heavy percentage of heart wood is not practicable, as the proper treatment of sap wood makes it equal to and in fact superior to heart wood untreated. A premium must be paid for standard heart lumber. If, however, the lumber is to be used untreated and where exposed to the weather, specific heart contents should be specified.

Under the auspices of the U. S. Department of Commerce, Division of Simplified Practice, the standardization of lumber has progressed considerably during the past two years, through work by representatives of producers, distributors, and consumers operating jointly in the central and the consulting committees on lumber standards. The work so far completed is covered by pamphlets, issued December 13, 1923, and May 1, 1924.

The importance of this development in the merchandising of lumber will be appreciated as influencing future practices. The American Lumber Standards adopted to date went into effect July 1, 1924. Ideas should be adjusted to the new arrangements, which comprise shipping and inspection conditions for all kinds of lumber, but grades and sizes for softwood yard lumber only. The latter class of material was standardized first because it constitutes the bulk of the lumber consumed. Railroads use enormous quantities of softwood yard lumber in building construction, and so are interested in what has been accomplished in the simplification of grades to a total of 9 and of sizes to 50 per cent of those which have prevailed.

Further progress is to be expected. Within a short time recommendations as to standard structural timbers will be issued, since the basic grading rules are already worked out.

Tie Inspection Faulty

Forest products are produced over wide areas of territory and under widely varying conditions, and without controlled supervision it is practically impossible to maintain a uniform application of specifications. Cross ties are now procured under a single standard by 95 per cent of the railroads, and lumber and timbers will soon be standardized for all consumers.

The committee is, therefore, of the opinion that the American Railway Association should establish some means of familiarizing itself with the inspection of forest products, beginning with cross ties, for the purpose of insuring a uniform application of the standard specifications, thereby stabilizing the tie industry and reducing the cost of production, and to this end, has recommended that this movement be carried on by Division VI—Purchasers and Stores, which should bring to the attention of the railroads any departure from A. R. A. standards by their inspectors, until such time as it may be found advisable to constitute an organization devoted to that work.

It is also recommended that the general committee be empowered to appoint a reviewing committee on the subject of forest products inspection, the function of this reviewing committee to be to receive and pass upon complaints from members that the inspection of forest products is not being carried out in a manner to insure uniform application of the standards of this association. This committee should be composed of not less than three or more than five members, who should hold office for a term of three years. Not more than one-half of the membership should be changed in any one year, to insure continuity of a portion of the committee, and to so provide, the first appointments should be on the basis of 1, 2 and 3 years' service.

*Abstracted from a report of the Committee on Forest Products of Division VI—Purchases and Stores—of the American Railway Association. Presented by J. H. Waterman, superintendent of timber preservation, Chicago, Burlington & Quincy, Galesburg, Ill., chairman, before the annual meeting at Atlantic City, N. J., on June 17.

It should be the duty of this committee to receive complaints from any member who believes the inspection of forest products is not being made in accordance with the standard specifications of the association. Upon receipt of such complaint the committee should develop the facts, and if the investigation sustains the complaint, bring the matter to the attention of the member at fault, with a view to having the necessary steps taken for correction.

Should the member at fault fail to take corrective action at the suggestion of the reviewing committee, it should be the duty of the committee to disclose all the facts in a duly prepared report at the annual meeting of Division VI. By a vote of the association in annual meeting, the report of the reviewing committee should be forwarded to the secretary of the American Railway Association for the consideration of the executives of that association.

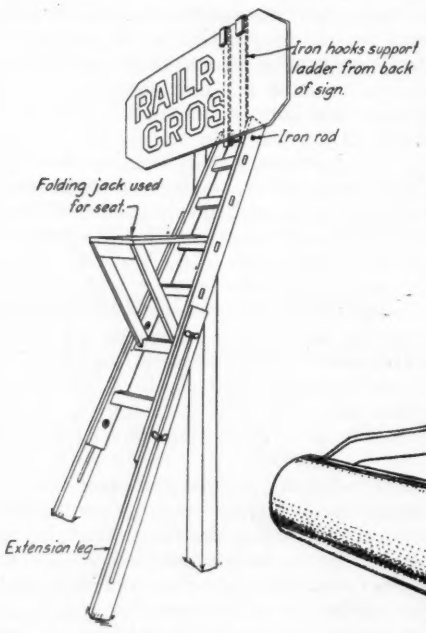
In the event expenses are incurred by the reviewing committee for the purpose of ascertaining the facts such expense should be borne by the member not properly carrying out the specifications of this association or by the complaining member in case the charge is not sustained by the committee.

This report was accepted by the association.

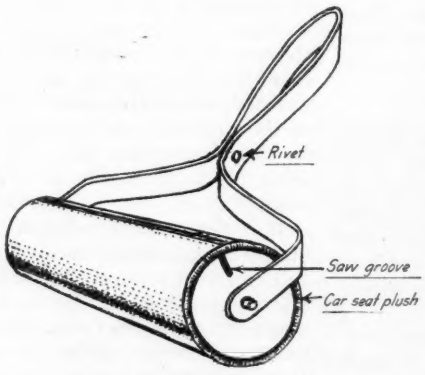
Painting Cast Iron Signs in a Terminal Area

By H. S. Bird
Foreman Painter, Philadelphia & Reading, Philadelphia, Pa.

On tracks outside of terminals, sign painting can best be done by small gangs, transported from one location to the next on a motor car, but in congested terminals the use of the motor car is impracticable, and usually the signs are so close together that no saving in time would be gained if the motor car were used. Under such circumstances the best practice is to have a man work alone, traveling on foot and carrying his equipment with him.



The Ladder Should Have Extension Legs.



The Roller Is Covered With Seat Plush.

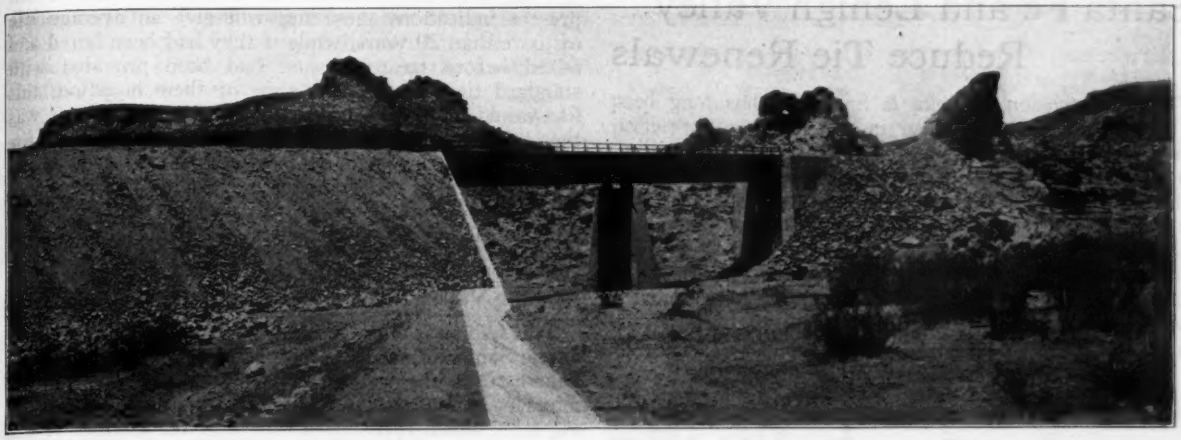
Most of the signs on the Philadelphia & Reading are of cast iron with the letters or wording cast on the face of the sign and protruding in bold relief, resembling printers' type. There are also quite a number of the old style wooden signs with the wording of a white letter on a black background. I have tried heavy paper stencils for these wooden signs, but owing to difficulty in handling the stencils, especially in windy weather, I have found that time can be saved and a better job can be had in lettering by hand, following the pounce of a paper pattern. Therefore it is necessary to employ a man somewhat skilled in lettering. On his first trip he prepares the sign for painting, being equipped with a wire brush, a scraper, an 8-O brush, a pot of paint and a specially built ladder, which is of a straight single type 5½ft. long with extension legs on either side, which are adjusted with thumb screws to suit the position of the signs that are sometimes located on the side of an embankment or other difficult positions where there is bad footing for a ladder. After removing all scale, blisters, and loose paint, the bare iron is wire brushed and touched up with red lead paint, followed with two coats of white paint. The signs are then relettered cut-in style, that is, the background is painted black, allowing the lettering to remain white.

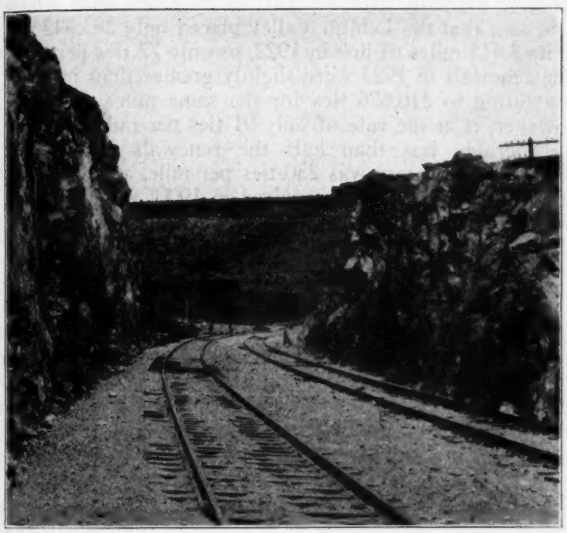
The raised letter or cast iron sign is painted in a different manner. Instead of receiving a preparatory coating of white, they are painted black and the facing of the raised letters is painted white. This lettering was originally done by hand but owing to the slow progress made we have devised a roller to take the place of the hand lettering. I find this to be a great time saver. It is a little awkward or difficult to handle at first but as the operator becomes more proficient, a perfect job is done in much less time. I have made a test of this work in comparison with hand lettering and find that a small double-face sign consisting of 86 letters located at a passenger station on an intertrack fence was lettered by hand in 40 min., including several interruptions by passing trains. The same character of sign was lettered with the roller in 5 min. without interruptions. On larger signs, however, the difference in time would not be as great.

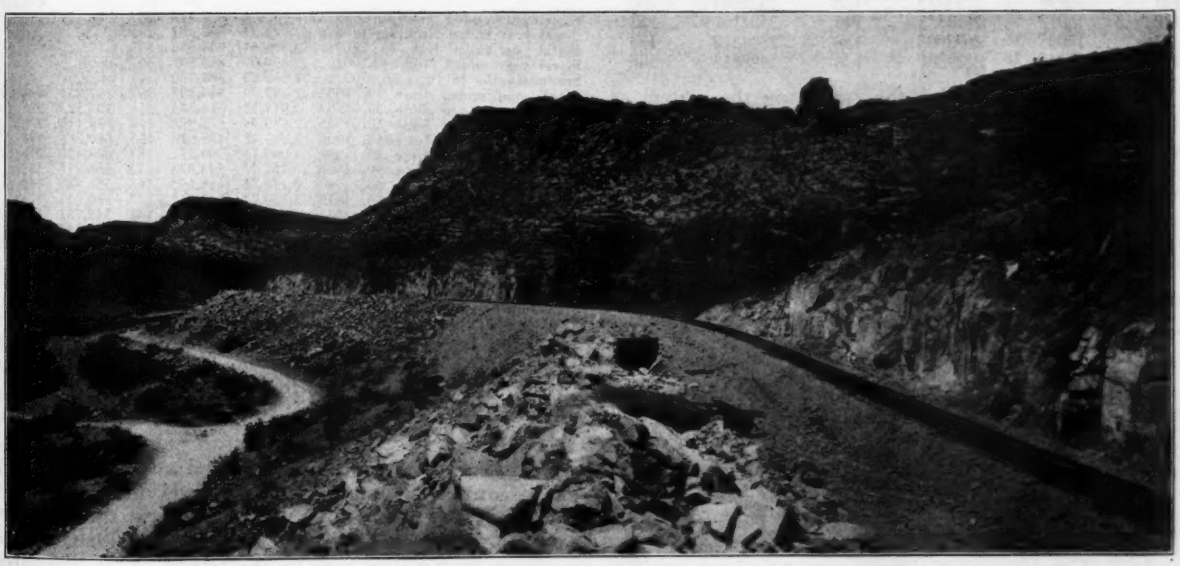
The roller is made of wood 2 in. in diameter and 10 in. long with a saw groove in the length of the roller ¼ in. deep. A wire nail driven in the center of each end of the roller serves as an axle. The handle is made of ⅛ in. by ⅞ in. band iron. The roller is covered with a strip of car seat plush, the ends of which are inserted into the saw groove. It is not necessary to paste or glue the plush on the roller if it it is properly inserted in the groove.

To operate the roller a board is required an inch or two wider than the roller and about 14 in. long. A heavy coating of paint is first applied to the board with a brush and then the roller is passed back and forth over the paint until heavily charged; the roller is then passed back and forth over the projecting letters on the sign with a rather firm pressure, until the letters are thoroughly covered with paint. There will probably be some little smear on the background, which can easily be wiped off or touched up. Most of this can be avoided by careful operation. On signs of large lettering it is best to do only a few letters at a time, but on small signs where the roller spans the width of the sign it can be passed over the entire length at one sweep.

Care and attention are required to keep the paint from drying or hardening on the roller over night. This can be done by wrapping the roller in several thicknesses of wet newspapers. When the roller is not in use it should be thoroughly cleaned with turpentine or gasoline.







Santa Fe Is Carrying Out Extensive Second-Track Program in the Southwest

With the completion of more than 200 miles of second track in New Mexico, Arizona and California during the last two years, which is now being supplemented by considerable additional mileage, the Santa Fe is rapidly providing the equivalent of double track for the entire distance from Chicago to Los Angeles, with the exception of a portion of one engine district. The pictures cover some of the heavier portions of the work in western Arizona.

Santa Fe and Lehigh Valley Reduce Tie Renewals

THE Atchison, Topeka & Santa Fe has long been recognized as a pioneer in the consistent preservation of its ties, having followed this practice continuously since 1885. It is natural, therefore, to look to this road for an indication of the results which a railway may expect to secure by adhering to this practice consistently. For this reason the following figures showing the number of ties inserted for renewals in all tracks on the system is of particular interest as indicating the progressive decline in the number required for this purpose.

Year	Total Miles of Track	Total Ties Inserted for Renewal	Total Ties Inserted per Mile of Track	Average Number of Ties Inserted for Renewals Annually for Five-Year Period	Average Number of Ties Inserted per Year per Mile of Track for Five-Year Period
1898	8185	2751849	336	.....	...
1899	9028	2246250	249	.....	...
1900	8804	1687537	192	.....	...
1901	9368	1557880	166	.....	...
1902	9557	1954823	204	2039668	229
1903	9768	2352502	241	1959798	210
1904	10237	2770306	271	2064610	215
1905	10885	2788378	256	2284778	228
1906	11637	2291997	197	2429601	234
1907	11694	3364921	288	2713621	251
1908	12169	3666798	301	2976480	263
1909	12601	3690633	293	3160545	267
1910	13379	3758984	281	3354667	272
1911	13889	3738854	269	3644038	286
1912	14488	3192585	220	3609571	273
1913	14766	2850823	193	3446376	251
1914	15293	2728629	178	3253975	228
1915	15409	3191823	207	3140543	213
1916	15517	3118941	201	3016560	200
1917	15661	2483651	158	2874773	187
1918	15931	2456203	154	2795849	180
1919	16087	2302952	143	2710714	173
1920	16899	2753673	163	2623084	164
1921	16912	2514325	149	2502161	153
1922	17005	2693905	158	2544212	153
1923	17346	2229201	128	2498813	148

In addition to observing the results on the system as a whole, this road has installed a large number of test sections from year to year in which various kinds of ties and of treatments are being watched. A further indication of the possibilities of treatment is afforded by the results of the recent inspection of one of these test sections of creosoted ties which were installed in the Emporia, Kan., cutoff in 1906, the record of which is as follows:

		Taken out		
	Rotten	Mechanical Wear	Other Causes	Total
Original number inserted				24,238
1915	..	...	7	7
1917	..	16	8	24
1918	..	..	8	8
1920	3	...	315	318
1921	..	...	49	49
1922	..	427	...	427
1923	..	784	...	784
Total taken out				1,617
Total remaining in track				22,621
Average life in track to 1923				16.93
Per cent of ties removed from track				6.67

From the above it is noted that these ties had given an average life of 16.93 years at the time of their last inspection on December 31, 1923, at which time only 6.67 per cent had been removed from the track. From present indications these ties will give an average life of more than 20 years, while if they had been bored and adzed before treatment and had been provided with standard tie plates at the time of their insertion, this life would have been extended still further. As it was these ties were installed before the development of the boring and adzing machine and were provided originally with six-inch tie plates which were later replaced with the present Santa Fe standard tie plate, incident to the replacement of which considerable adzing was done by hand.

Lehigh Valley Reduces Tie Renewals to 91 Per Mile

The Lehigh Valley has not been treating ties as long as the Santa Fe, but has a record of renewal work which demonstrates the value of this practice in as striking a manner. The progress made is shown in the accompanying table which furnishes a record of the number of ties renewed annually over a period of 26 years from which it is seen that the Lehigh Valley placed only 263,342 ties in its 3,413 miles of line in 1922, or only 77 ties per mile. The renewals in 1923 were slightly greater than in 1922, amounting to 310,676 ties for the same mileage, which, however, is at the rate of only 91 ties per mile. This is considerably less than half the renewals required in 1898, when the rate was 230 ties per mile, and less than one-fourth the renewals required in 1900, when the rate was 336 ties per mile, notwithstanding the appreciable

TIE RENEWALS—LEHIGH VALLEY RAILROAD

Year	Total miles of track	Total ties inserted for renewal	Total ties inserted per mile of track	Average number of ties inserted for renewals annually for five year period	Average number of ties inserted per year per mile of track for five year period
Fiscal year ended Nov. 30 1898	2,740.61	627,417	230	.....	...
Fiscal year ended Nov. 30, 1899	2,776.91	680,052	245	.....	...
Fiscal year ended Nov. 30, 1900	2,806.64	944,096	336	.....	...
Fiscal year ended Nov. 30,1901	2,858.09	850,797	301	.....	...
Seven months to June 30,1902	2,862.53	308,300	...	.....	...
Fiscal year ended June 30, 1903	2,892.99	886,895	307	797,851	284
Fiscal year ended June 30, 1904	2,911.33	614,273	211	795,222	280
Fiscal year ended June 30, 1905	2,930.24	575,992	196	774,410	270
Fiscal year ended June 30, 1906	3,060.42	475,620	155	680,715	234
Fiscal year ended June 30, 1907	3,090.14	569,272	184	624,410	210
Fiscal year ended June 30, 1908	3,157.77	544,934	172	556,018	183
Fiscal year ended June 30, 1909	3,170.76	618,593	195	556,882	180
Fiscal year ended June 30, 1910	3,190.71	544,747	177	550,633	176
Fiscal year ended June 30, 1911	3,198.57	451,232	141	545,755	174
Fiscal year ended June 30, 1912	3,244.96	534,413	164	538,784	170
Fiscal year ended June 30, 1913	3,277.47	877,558	267	605,308	189
Fiscal year ended June 30, 1914	3,312.58	770,679	232	635,726	196
Fiscal year ended June 30, 1915	3,320.03	959,811	289	718,738	218
Fiscal year ended June 30, 1916	3,383.53	968,403	286	822,173	247
Six months to December 31, 1916	3,396.08	427,163	...	.....	...
Year ended December 31, 1917	3,407.58	608,835	178	837,057	250
Year ended December 31, 1918	3,395.87	589,997	173	779,545	231
Year ended December 31, 1919	3,393.47	662,031	195	757,815	224
Year ended December 31, 1920	3,398.86	395,414	116	644,936	189
Year ended December 31, 1921	3,401.46	454,114	133	542,078	159
Year ended December 31, 1922	3,412.92	263,342	77	472,980	139
Year ended December 31, 1923	3,414.39	310,676	91	417,715	122

increase in mileage since that time and a very substantial increase in the amount of traffic handled. Further examination of the table shows that in general the rate of renewals has been conspicuously less since 1916. This is shown particularly well by the record of tie renewals on a five year basis, the ratio showing a steady decline from the figure of 250 ties per mile for the five years up to and including 1916, to the low figure of 122 ties per mile for the five years up to and including the year 1923.

This reduction, of course, is attributed chiefly to the

practice of treating ties which was begun on the Lehigh Valley in 1910. Presumably even better results will follow with the gradual exhaustion of untreated ties in the track and the corresponding increase in the number of treated ties in service.

Rail Output Greater in 1923

ACCORDING to statistics issued by the American Iron and Steel Institute, the production of steel rails in 1923 was 2,904,516 gross tons, or 732,740 tons more than the total of 2,171,776 tons in 1922. The output of rails in 1923 is the largest since 1917. However, there have been eight years since 1902 when the total production of rails exceeded the production of last year.

Years	Open-hearth	Bessemer	Rerolled*	Electric	Iron	Total
1909	1,256,674	1,767,171	.....	†	...	3,023,845
1910	1,751,359	1,884,442	.....	†	230	3,636,031
1911	1,676,923	1,053,420	91,751	462	234	2,822,790
1912	2,105,144	1,099,926	119,390	3,455	...	3,327,915
1913	2,527,710	817,591	155,043	2,436	...	3,502,780
1914	1,525,851	323,897	95,169	178	...	1,945,095
1915	1,775,168	326,952	102,083	...	...	2,204,203
1916	2,269,600	440,092	144,826	...	...	2,854,518
1917	2,292,197	533,325	118,639	...	...	2,944,161
1918	1,945,443	494,193	101,256	...	...	2,540,892
1919	1,893,250	214,121	96,422	50	...	2,203,843
1920	2,334,222	142,899	126,698	297	...	2,604,116
1921	2,027,215	55,559	96,039	5	...	2,178,818
1922	2,033,000	22,317	116,459	...	...	2,171,776
1923	2,738,779	25,877	139,742	118	...	2,904,516

*Rerolled from old steel rails. Included with Bessemer and open-hearth steel rails in 1909 and 1910. †Small tonnages rolled in 1909 and 1910, but included with Bessemer and open-hearth rails for these years.

Probably the most noteworthy feature brought out by the statistics on rail production and which is illustrated in one of the accompanying tables, is the large increase in the production of rails weighing 100 lb. or more per yard. The tonnage of rails weighing 100 lb. or more totaled 1,465,850, an increase of 562,950 tons, or 62.4 per cent, over 1922, whereas the rails weighing 85 lb. and less than 100 lb. per yard totaled 864,965 tons in 1923, an increase of 136,361 tons, or only 18.7 per cent.

PRODUCTION OF RAILS BY WEIGHT PER YARD, 1907-1923

Years	Under 45 pounds	45 and less than 85	85 and less than 100	100 pounds and over	Total Gross tons
1907	295,838	1,569,985	1,767,831		3,633,654
1908	183,869	687,632	1,049,514		1,921,015
1909	255,726	1,024,856	1,743,263		3,023,845
1910	260,709	1,275,339	2,099,983		3,636,031
1911	218,758	1,067,696	1,536,336		2,822,790
1912	248,672	1,118,592	1,960,651		3,327,915
1913	*270,405	†967,313	2,265,062		3,502,780
1914	*238,423	†309,865	868,104	528,703	1,945,095
1915	*254,101	†518,291	742,816	688,995	2,204,203
1916	*295,535	†566,791	1,225,341	766,851	2,854,518
1917	*308,258	†882,673	989,704	763,526	2,944,161
1918	*395,124	†665,165	888,141	592,462	2,540,892
1919	*263,803	†495,577	965,571	478,892	2,203,843
1920	*489,043	†433,333	952,622	729,118	2,604,116
1921	*211,568	†214,936	902,748	849,566	2,178,818
1922	*265,541	†274,731	728,604	902,900	2,171,776
1923	*272,794	†300,907	864,965	1,465,850	2,904,516

*Includes rails under 50 pounds. †Includes 50 pounds and less than 85 pounds.

In considering these figures from the standpoint of the application of rails to railroads use, it is necessary to bear in mind that, of the total output, 573,701 tons comprised rails weighing less than 85 lb. per yard, which are absorbed almost entirely by industrial plants, mines, contractors, logging railways, etc. In addition, although probably representing some overlap, 130,056 gross tons were rolled into girder or high T rails for electric and street railways. Furthermore, about 260,000 tons of rails were exported while the imports are practically negligible.

Another interesting fact brought out by the statistics is the almost entire elimination of the Bessemer process in the manufacture of steel rails. Of the total tonnage only 25,877 tons were of Bessemer steel. However, when we consider the figures as applying to those weights of rail normally purchased by the railroads, namely, rails weighing 85 lb. or more per yard, we find that only 2,920 tons were of Bessemer steel.

PRODUCTION OF RAILS BY WEIGHTS AND PROCESSES, 1923

Kinds	Under 50 lbs. Gross tons	Per cent	50 to 84 lbs. Gross tons	Per cent	85 to 99 lbs. Gross tons	Per cent
O. H.	155,124	56.86	282,169	93.77	836,160	96.67
Bess.	5,728	2.10	17,229	5.73	2,514	.29
Other	111,942	41.04	1,509	.50	26.291	3.04
Total	272,794	100.00	300,907	100.00	864,965	100.00

Kinds	100 lbs. and over Gross tons	Per cent	Total Gross tons	Per cent
O. H.	1,465,326	99.96	2,738,779	94.29
Bess.	406	.03	25,877	.89
Other	118	.01	139,860	4.82
Total	1,465,850	100.00	2,904,516	100.00

Another fact brought out in the statistics is that 139,742 tons of rails were rerolled from old rail, this being the largest output since 1916, when the total was 144,826 tons.

PRODUCTION OF RENEWED AND REROLLED RAILS, 1915-1923.

Years.	Rerolled from New Seconds, New Defective Rails, etc. Open-Hearth.	Bessemer.	Total.	Rolled from Old Rails.	Total Rerolled.
1915	6,477	2,652	9,129	102,083	111,212
1916	1,711	2,149	3,860	144,826	148,686
1917	1,825	7,182	9,007	118,639	127,646
1918	13,296	19,462	32,758	101,256	134,014
1919	1,933	5,766	7,699	96,422	104,121
1920	19,493	1,979	21,472	126,698	148,170
1921	6,525	702	7,227	96,039	103,266
1922	996	.....	996	116,459	117,455
1923	16,640	561	17,201	139,742	156,943

One of the tables shows the production of alloy steel rails in which it is seen that a marked reduction has taken place in the activities of this branch of the industry. Thus in 1923 the total output of all alloy steel rails was 2,142 gross tons, a reduction of 1,021 tons, or nearly one-third from the total of 1922 and almost a negligible quantity as compared with 257,324 tons in 1910.

Years.	Production by Alloys. Total Production, Gross Tons	Titanium	Other Alloys	Production by Processes. Open-Hearth and Elect	Bessemer	Production by Weight Per Yard. Under 50 Lbs.	50 and Under 85 Lbs.	85 and Under 100 Lbs.	100 Lbs. and Over
1913	59,519	47,655	11,864	33,567	25,952	91	9,414	50,014	
1914	27,937	23,321	4,616	27,447	490	14	1,168	8,301	18,454
1915	24,970	21,191	3,779	24,367	603	6	1,977	6,555	16,432
1916	28,562	26,493	2,069	27,675	887	..	1,761	10,506	16,295
1917	16,535	15,273	1,262	16,535	.....	..	335	6,671	9,529
1918	3,111	2,891	220	3,111	.....	..	47	2,640	424
1919	6,476	6,207	269	6,476	.....	..	.....	3,920	2,556
1920	12,909	11,652	1,257	12,909	.....	..	514	5,069	7,326
1921	6,276	2,804	3,472	6,276	.....	..	71	4,277	1,928
1922	3,163	2,493	670	3,163	.....	..	321	835	2,007
1923	2,142	346	1,796	2,142	.....	..	56	317	1,769

A Typical Transverse Fissure

Helpful Hints on Safety

By J. F. Williamson
Roadmaster, Northern Pacific, Dickinson, N. D.

PERSONAL injuries cause suffering in many ways, as by the loss of an arm, a leg or an eye; and a wife and children may go hungry and needy because someone neglected his duty. It is important, therefore, for every workman to be acquainted with those measures that should be practiced to prevent some of the personal injuries that occur to trackmen.

How to Unload Rock and Rail

Unloading material such as ties, rail and rock for rip-rap is the most dangerous kind of track work as it is not done every day and laborers are not as familiar with it as with their usual daily work. Moreover, this kind of work is usually done with a work train and there is a hurry to get the cars loaded or unloaded as quickly as possible. Unless care is used, therefore, someone is likely to be hurt. Where two men have been accustomed to work together on the track they should be permitted to work together when handling heavy material. Being acquainted with each other's ways of working they will not pick up a tie until both have hold of it and by so doing each will avoid turning it over on the other's hand or catching him between the tie being carried and the tie next to it. When several men are handling heavy material, such as rail, one man in the gang should be a lookout man. He should see that the men are in their proper places and tell them when to pick up and when and how to lay down.

Don'ts That a Foreman Should Teach His Men

There are many common practices which a foreman should teach his men not to do if accidents are to be avoided. The following are some of these don'ts:

Don't stick a pick in an old tie when someone is near, as it may glance and strike the other person on the foot or leg.

Don't pull a new tie into place with a pick. Use tie tongs.

Don't pull on tie tongs until you know they won't slip off.

Don't use dull tie tongs as they may slip off, causing you to fall across the opposite rail with a possible chance of an injury which may cripple you for life.

Don't stand in the hole made for a new tie while pulling the new tie into place. Always stand with one foot on each side of the hole, otherwise the tie may slip in place easier than expected and catch a foot.

Don't use a defective tool of any kind, especially maul handles and track chisels for if they splinter or break in your hand they cut like a knife.

Don't hit a spike a hard blow until after it has been set in the wood firmly by light taps. Otherwise it may fly, striking you or someone else.

Don't use a burred track chisel or spike maul as a piece may fly off and hit you or someone else.

Don't fail to stand on the opposite side of the rail when cutting off nuts from bolts, so that if pieces of the nut fly they will not strike you.

Don't stand in front of the rail yourself or permit anyone else to do so while a rail is being changed out, especially in hot weather, for when the rail is forced out of track it is liable to jump and strike you, even when you think you are in the clear.

Don't stand too close to trains while they are passing, as a piece of coal, timber, etc., is liable to fall off, causing a serious injury.

Don't forget to examine the motor or hand car carefully before starting to see that there is nothing likely to fall off and derail the car.

Rules for the Foreman Himself

To prevent accidents it is not enough for the foreman to know what the man in the gang must not do, since there are many rules which he himself must observe as an officer. The more important of these rules are as follows:

Don't allow quarreling, disputes or arguments in the gang, for an unfriendly feeling among the men will result in recklessness while doing their work; while men who are friendly will be more careful of their own safety and that of their fellow workers.

Don't allow two men to pick up one end of a motor, hand or push car before the others are ready, for this will give the last ones a much heavier load and may cause one of the men to strain his back or cause an injury that will develop into a rupture. Motor cars, hand and push cars should be either picked up together or turned off. This rule applies to any other heavy lift as well.

Don't allow men to get on a hand or motor car while it is in motion, except the man that gives it a push to start it and this man should get on the rear end, not on the side of the car.

Be prepared to stop instantly when approaching all highway crossings. Teach the men on approaching the crossing to watch both ways for automobiles, as neglect to do this may result in fatal injuries to every man in the gang.

Instruct the men to watch passing trains, as they may discover broken flanges, dragging brake beams, etc., which should be called to the attention of trainmen. It may prevent an accident, loss of property and possibly loss of lives.

Keep the minds of your men as much as possible on their work. Special care should be taken with new men when they are put to work. These men have to be educated how to protect themselves and their fellow workmen. It is the foreman's job to do this.

The foreman is the one to practice safety first rules, as he sets the example.

The Elimination of Waste—Saving Time*

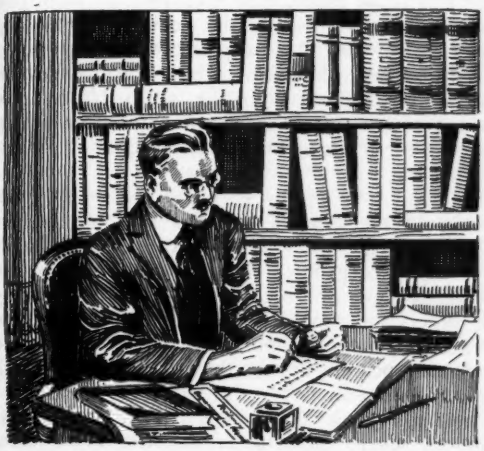
By Dave Sexton
Section Foreman, Kansas City Southern

THE GREATEST saving that can be made is in the saving of time. While we are at work our time belongs to the railroad, therefore we should use it to the best advantage. The foreman should have his gang organized so that each man will know his particular place at whatever job he may be working. He should have his work planned and know what he intends to do the next day and on arrival at the place of work he should proceed at once with all of his men at their regular places.

In surfacing track, I have certain men run the jacks. They know their places and just what each has to do without having to be told. The same can be said about scythes, in cutting right-of-way. If the foreman has four men they should all cut on one side of the track at the same time, each taking his own particular swath, and save the time it would take for two men to walk from the track to the outside of the right-of-way, or climb up and down the dump. Time can also be saved where dirt, etc., is to be trucked a great distance by using the hand car to push back the empty push car.

*Abstracted from a paper presented before a meeting of the Kansas City Southern Maintenance of Way Association at Neosha, Mo.

What's the Answer?



This department is intended to help our readers secure answers to the questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. An endeavor will be made to answer promptly by mail, any questions received. Such questions as are of general interest will also be submitted in these columns for further discussion. *Railway Engineering and Maintenance* solicits the co-operation of its readers in answering the questions which are published.

Questions to be Answered in the October Issue

1. *To what extent is a northern road warranted in maintaining uniform track forces throughout the year? What constructive and necessary work can be done efficiently during the winter?*

2. *What is the most efficient ratio of helpers to carpenters in bridge and building gangs.*

3. *What preparations should yard track gangs make for winter?*

4. *What can be done to keep insects away from fresh paint?*

5. *Should railways encourage industries to contract the construction and maintenance of their tracks or can this be done to better advantage by railway forces?*

6. *How can one determine the amount of radiation required for heating an ordinary frame building with hot water? With steam?*

7. *How should the responsibility for the maintenance of insulated joints be divided between track and signal forces?*

8. *What is the best method of sludging out treating plants where the open ditch or tile line is apt to freeze or clog up in winter?*

Examining Scrap Before Shipment

Should the supervisor be expected to examine scrap before allowing it to be loaded for shipment to prevent the inclusion of usable material?

First Answer

The supervisor should not be required to inspect scrap before shipment is made as this might taken him away from more important work or result in delay to the scrap movement. The section foremen can surely be trusted to grade their scrap, but if a mistake is made, it would be rectified at the storehouse or reclamation plant by the men in charge.

W. A. RODERICK,
Roadmaster, Wheeling & Lake Erie, Dillonvale, Ohio.

Second Answer

A supervisor should be responsible for the loading of scrap for shipment and take any means necessary to prevent the shipment of usable material. Rather than wait until the scrap is being loaded for shipment before making an examination, a supervisor should start salvage work wherever material is used and see that good material does not go into scrap, the object being to reduce reclamation to a minimum by using material over without first scrapping and then reclaiming it. A certain amount of good material will slip by this line of defense, but the individual foremen can further reclaim usable material before it is shipped from the section or gang.

It is questionable if a supervisor should confine himself to any one job except in case of a real emergency. Rather he should have his force so organized and so instructed and his supervision should be such that usable material does not go into scrap.

F. J, MEYER,
Assistant Engineer, New York, Ontario & Western, Middletown, N. Y.

Third Answer

The supervisor should be expected to examine scrap before allowing it to be loaded for shipment to prevent the inclusion of usable material. In the first place, however, there should be no usable material in the scrap bins. Usable material should be used again at the time it originates. If, because of change of weight of rail or for some other reason it cannot be used where renewals are being made, then it should be brought to an assembling place but not placed in the scrap bin. The best practice is to unload any questionable material on the ground in front of the bin and have it carefully picked over and the scrap placed in the bin preparatory to loading.

In separating the usable material from scrap it is well to separate the usable material into grades: the first grade including that good for use again in high speed tracks; grade two, that good for use again in side and yard tracks, etc. This will prevent second hand spikes and bolts reaching high speed track jobs where they are not fit for use and will place them on jobs where such use will be satisfactory and economical.

Where scrap cars are loaded by more than one supervisor the one receiving partially loaded cars should carefully examine the loads and if he finds good material with the scrap he should not accept the cars until the supervisor from whom the loads came has made a joint inspection in company with the roadmaster or division

engineer. Supervisors should, when consistent, ride scrap cars, which are most satisfactorily handled with monthly supply cars.

Supervisors and foremen should be so close to the material and scrap situation on their respective territories that no usable material would ever reach the scrap bins, and at no time should an over-supply of usable material be found. Material not required for immediate use should be returned to the store house at once to reduce line stocks and enable the storekeeper to fill requisitions without purchasing.

The interior of tool houses and the premises around them should be standardized as far as is practicable to provide a place for each class of materials and tools. The supervisor should then insist that each be kept in its place. Attics, blind shelves and other "catch-alls" should not be allowed. All tools and materials should be in sight and should correspond in number with a standard tool list posted in the tool house.

Returning to the subject of loading scrap on cars, supervisors should be thoroughly familiar with store department loading classifications to reduce rehandling at the storehouse scrap dock to a minimum. All cars should be light-weighed and stenciled and everything done to advance the movement of the load from point of loading to the destination where sold. The records on the Illinois Central clearly indicate that field classification is economical not only in labor saved in rehandling but in car-days saved.

A section foreman on the Illinois Central would be surprised if he were not greeted with a "Show me your scrap dock" by the supervisor, roadmaster and superintendent. The general officers are exacting about this and consequently the maintenance of way and maintenance of equipment officers take pride in trying to maintain a clean railroad and keep the usable material separate from scrap.

G. M. O'Rourke,
Roadmaster, Illinois Central, Carbondale, Ill.

An Inspector to Supervise Tie Renewals

Does the employment of a tie inspector to aid the section foreman in spotting ties for renewal promote uniformity in tie renewals? Is the employment of such a person to be recommended?

First Answer

The material and labor involved in making tie renewals represent a very large percentage of railway maintenance of way operating expenditures. Many of the old and well trained section foremen can be depended upon to exercise good judgment in making replacements. The matter is of such importance, however, that generally it should not be left to the section foreman's judgment alone.

The method of supervision employed, however, will necessarily depend largely on the type of organization in effect on any particular railroad. On our lines we have a divisional organization in which the division superintendent is in responsible charge of both operation and maintenance, subject to direction and general supervision from the general officers. Under such an organization I do not think it is advisable to employ tie inspectors to work out of the general office and to exercise control over tie renewals, for this plan introduces a conflict between the authority of the inspector and that of the roadmaster or track supervisor and other division officers.

If the track supervisor is to be held responsible for the condition of his district he should control tie replacement work the same as any other maintenance work coming under his jurisdiction. This can be handled best by having the track supervisor walk over his entire district in the fall of the year, accompanied by the section foreman and actually spot every tie in the track which, in his judgment, should come out during the following year. A list should be kept showing the number of ties to be renewed in each mile of main line and by stations the number of ties required for siding replacements. The list of tie replacements so prepared will give information on which to base the distribution of ties accurately and should make it possible to have ties provided where they are needed without incurring heavy expense for trucking or for reloading and redistribution.

The rule should be rigidly enforced that the section foreman should not remove any ties not marked for removal by the track supervisor except in case of derailment or actual emergency. Any ties removed by the foreman which have not been marked for removal by the track supervisor should be held for his inspection.

The track supervisor should be required to make another close inspection during the late spring to check up the replacements made by the foreman and to spot any bad ties which may have been passed on the first inspection. At every opportunity division and general officers while making motor car inspection trips should check up on the tie renewals being made, noting the character of ties removed and how new ties installed are being handled, especially with respect to mutilation of treated timber by the destructive use of shovels, picks and mauls.

H. M. Lull,
Chief Engineer, Southern Pacific, Texas and Louisiana Lines, Houston, Tex.

Second Answer

The purpose of adopting measures to regulate tie renewals is quite definite. It is that every tie capable of functioning until the season next following that for which the inspection is made, shall be retained in track. There are several elements that are to be considered, however, which materially affect the judgment given in respect to the value of the tie under inspection.

The purpose which the tie serves is the first. So long as satisfaction is given in supporting the rail, in holding gage and in providing bearing enabling suitable tamping, it is evident that the tie will give further service. There may be defects, superficial or within the tie, at places other than within those zones which serve the purposes noted above, which should not condemn the tie unless there is absolute assurance that such defects will render the tie useless before the next opportunity for its removal.

The durability of the timber is a second factor. This is naturally dependent upon the kind of wood and the manner in which it was handled or prepared before being placed in track, as well as upon the climatic conditions while in service. Certain species of the more durable woods may still be used with economy in their native condition, such as the southern yellow pine, white oak, chestnut and others of less prolific growth. All other classes, representing by far the great majority of all ties used, require preservative treatment. In fact, even those ties of the more durable species mentioned, unless placed in locations where their service in their natural state is limited by mechanical wear, should be treated.

The condition which the inspector of ties-for-renewal meets, however, is one of involving both treated and untreated ties. If it is an untreated white oak, yellow pine or other durable species and not visibly defective

though much aged and approaching a "brashy" condition, it is deserving of careful inspection and a presumption of further service as it lays. If treated by one of the processes known to be effective, the tie is free from decay unless it had been attacked prior to treatment or had been in service under climatic and track conditions which resulted in "mushiness" where worn under the tie plate or rail. In many instances the treated tie, badly worn under the rail, can be saved for additional service, either on the site or in tracks where traffic is less severe, simply by turning it over. The objection sometimes raised against turning untreated ties that they go to pieces very shortly when the under side is thus exposed to the air, is removed by the preservation of the wood fibre in the treated tie.

The tie, split prior to installation or during its service, should also be given the benefit of the doubt when considering its removal. If it still supports the rail, it probably serves well in conjunction with its neighboring ties unless under severe conditions of traffic.

The character of traffic is a third factor to consider. Progress in conservation of ties, other than those whose life is limited by the severity of traffic, has been greatly advanced by the extension of preservative treatment. The larger proportion of the mileage of the railroads is of a character whereon ties preservatively treated will give a decidedly long life. For the lines of denser traffic, timber of most durable species should be selected. Added protection against splitting should be provided by using S-irons. Maximum protection against wear should be secured by the use of larger and heavier tie-plates, preferably canted. A higher standard of cross tie condition is required under these circumstances, and the inspector will naturally fix that standard in his mind at a point where removal will be required unless the tie is giving sufficiently uniform service in conjunction with the neighboring ties.

Where there is waste in tie renewals due to a too liberal inspection, it usually arises from a natural desire of the practical track man, when considering a questionable tie, to give the track the benefit of the doubt and remove the tie. When that is done, all chance of further life from that particular tie is removed, and the expense of a new tie is immediately placed upon the railroad. The decision means irrevocable loss. If the tie had been favored and retained, added life would have been secured, and the expense for a new tie saved. The decision would have involved no action that could not have been modified at any time and at less net expense to the company.

In this lies the justification for the employment of a tie inspector to aid the foreman, and in the absence of any more accurate method for determining requirements, such employment is warranted. As a result of the more careful inspection of ties for purchase, the use of standard grading and classification rules, the care and protection in seasoning yards, the preservative treatment and the selective use of ties to fit the service requirements, a scientific method of determining tie allotments is foreseen, however, which promises to replace other methods including that of inspection and spotting for renewals.

The tabulation of the kind and number of ties used in renewals during a period of years sufficient to fix the kind and number existing in track on a branch or sub-division would permit an estimation within reasonable limits of accuracy of the number of ties of the kind proposed for use over a succeeding period of years. With renewal requirements thus definitely fixed, the only inspection needed could be made by the section foreman under the direction of the supervisor, the latter having this past knowledge of his requirements as a control. A counting inspection without marking, supplying to the supervisor the information needed for uniform distribution, is all that would be required of the foreman.

Under such conditions the employment of a tie inspector would be unnecessary.

C. C. Cook,
Maintenance Engineer, Baltimore & Ohio, Baltimore, Md.

Third Answer

I think the employment of a practical track man to inspect, spot and mark ties for the section foremen to renew would be a great help to the section foreman, as well as the company. It would promote uniformity in tie renewals. There is so much difference in opinion between the track men and officers as to just when a tie has served its purpose in different kinds of track, and when it should be removed.

The principal question in my mind, however, is how much territory such a man would be able to cover. This would have to be worked out to suit conditions. It would be necessary for the inspector to start out a little in advance of tie renewing time and mark or spot a certain number of ties to be taken out for each section foreman, to give them all a start, and later on to work with them and mark ties in advance of tie renewals.

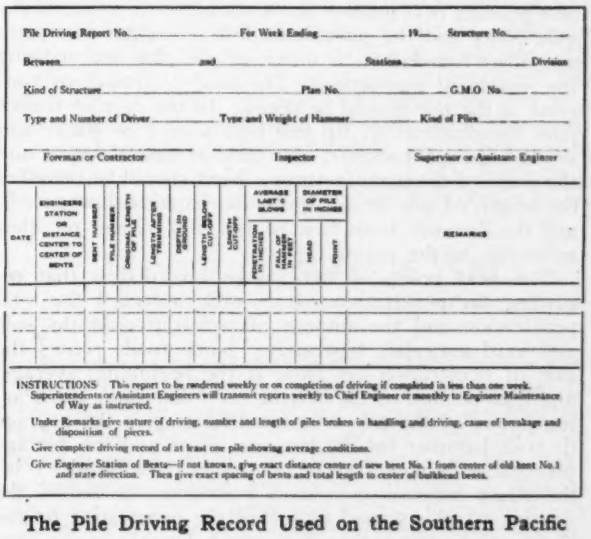
T. Thompson,
Roadmaster, Atchison, Topeka & Santa Fe, Joliet, Ill.

Forms for Pile Driving Records

What is the best form for a permanent pile driving record?

First Answer

The experience of the Southern Pacific, where a great deal of pile driving has been done regularly each year as is to be expected from a knowledge of the character of the country through which this road passes, has approved the form of permanent pile driving record



Pile Driving Report No. ____ For Week Ending ____ 19__ Structure No. ____

Between ____ and ____ Stations ____ Division ____

Kind of Structure ____ Plan No. ____ G.M.O No. ____

Type and Number of Driver ____ Type and Weight of Hammer ____ Kind of Piles ____

Foreman or Contractor ____ Inspector ____ Supervisor or Assistant Engineer ____

DATE	ENGINEERS STATION OR DISTANCE CENTER TO CENTER OF BENTS	BENT NUMBER	PILE HAMMER	ORIGINAL LENGTH OF PILE	LENGTH AFTER TRIMMING	DEPTH IN GROUND	LENGTH BELOW CUT-OFF	LENGTH CUT-OFF	AVERAGE LAST 6 BLOWS: PENETRATION PER BLOW	AVERAGE LAST 6 BLOWS: FALL OF HAMMER IN FEET	DIAMETER OF PILE IN INCHES: HEAD	DIAMETER OF PILE IN INCHES: POINT	REMARKS

INSTRUCTIONS This report to be rendered weekly or on completion of driving if completed in less than one week. Superintendents or Assistant Engineers will transmit reports weekly to Chief Engineer or monthly to Engineer Maintenance of Way as instructed.

Under Remarks give nature of driving, number and length of piles broken in handling and driving, cause of breakage and disposition of pieces.

Give complete driving record of at least one pile showing average conditions.

Give Engineer Station of Bents—if not known, give exact distance center of new bent No. 1 from center of old bent No.1 and state direction. Then give exact spacing of bents and total length to center of bulkhead bents.

The Pile Driving Record Used on the Southern Pacific

shown in the accompanying illustration as the most serviceable for all needs. This form provides for the complete information concerning the job, the date of driving, the kind of structure and equipment used, the kind of piles, the men in charge of the particular work as well as full information concerning the pile driving such as the location of the bents, the original length of pile, the length after trimming, the depth in the ground, the

length below the cut-off, the length of cut-off, the size of the pile, the penetration under the last six blows; also the date of driving, the file number covering the record of the work, and brief but sufficient instructions to govern the manner of making and submitting the report. In addition to furnishing all the information desired, the report also provides for the orderly arrangement of this information which is of considerable importance for reference purposes. As the form indicates, this report is rendered weekly or on completion of driving by the foreman in charge of the work and is transmitted to headquarters where the reports are filed for record.

It is customary, however, in addition to this report, to mark the regular trestle record with a statement showing the length of piles used in the structure, without, however, referring to the penetration, so that when ordering piling for renewal work it is only necessary to refer to the trestle record to ascertain that piles to a certain length are required for a satisfactory trestle.

G. W. REAR,

Engineer of Bridges, Southern Pacific, Pacific System, San Francisco, Calif.

Second Answer

The best form for a permanent pile driving record is a field book with appropriate ruling to provide spaces for the essential information. The record should be placed in the book by an inspector on the job after carefully observing the driving conditions and results.

The heading should contain reference to the location of the work on line or branch, contractor, pile driver number, and kind and weight of hammer. In case of the gravity drop steam hammer the make and number should be given, together with the number of strokes per minute, the height of fall and the weight of the entire hammer and the striking part separately. If a double-acting steam hammer is used, it is necessary also to record the diameter of the piston.

In the body of the report put in a date column so as to provide a continuous pile record and to give the opportunity to record the date each pile is driven. The best practice is to number the bents in the direction of the mile posts and the piles from left to right. For piers and other foundations a sketch or pile plan will indicate the system of numbering. The kind of timber or concrete in the pile should be noted. In the case of timber piles the diameter of tip and butt should be given, and in the case of concrete, the date of manufacture and the name of the manufacturer. Next should be recorded the length of pile in the leads, the length below cut-off, and the distance from base of rail, top of pier or other reference to the cut-off.

The next group of data to be recorded is that regarding the penetration. It is well to record the total penetration and the amount of penetration in the soft and hard materials separately. Some roads record the rate of penetration per blow at the beginning, average, and final portion of the driving. To determine the bearing power of the pile it is essential to give the average drop of hammer for the last few blows and the average penetration in inches of the pile under these blows. With the steam hammer it is more convenient to record the number of blows used to secure the penetration of the last six inches or other designated distance, or to give the distance penetrated for the last 10 or 20 blows. In the case of the double-acting steam hammer it is essential to give the average pressure in the cylinder at the time the final penetration is observed. From these data it is possible to compute the safe load for each pile by using an appropriate formula.

A column for remarks should be provided into which can be placed notes regarding the batter of piles, broken piles, whether rings or shoes were placed on piles and other information that may be desirable. Many roads record the total number of blows for driving the pile. It is also desirable to give the original length of the pile used, where a pile is cut off before being put in the leads, provided the part cut off is wasted and not driven as another pile.

For the record of test piles it is necessary to give the rate of penetration for each foot of the driving and as much information as is possible regarding the kind of soil, along with the data of ordinary driving as given above. It is especially important to get the complete record very accurately on the driving of test piles.

The records referred to are for the original field book notes. Where it is desirable to get the report of the work to the office before the field book can be turned in, report blanks can be made up similar in form to the headings for the field book pages. The data may then be copied from the note book and either daily progress or job reports sent to headquarters as required. All records should be signed and dated.

F. C. BALUSS,

Engineer of Bridges and Buildings, Duluth, Missabe & Northern.

Plowing Fire Guards

Under what conditions is the plowing of fire guards along the right-of-way advisable? What measures may be adopted to secure the plowing of these guards at minimum expense?

First Answer

My practice in plowing fire guards for the past 20 years has been as follows. In ordinary seasons guards are plowed in grain fields along the right-of-way to protect the fields from fire. This work is usually done by the land owner or renter, the section foreman and his men setting the grain shocks out of the way. This plowing is usually done without expense to the railroad company.

On the prairies the problem is different. These stretches are plowed by the farmer if possible, but where it becomes impossible to get the farmer to do the work a man with a team is hired to plow about eight furrows about 150 ft. from the track, then a second guard about 50 ft. farther back. This leaves a 50-ft. strip between the two guards. This strip is burned as soon as the men can get to it, thus making about 65 ft. of fire guard. Ordinarily the railroad pays the man for this plowing.

J. C. SPELLMAN,

Roadmaster, Chicago & North Western, Norfolk, Nebr.

Second Answer

The plowing of fire guards, even if it were not compulsory under the law, is advisable in every location where there is danger of fire creeping onto the lands adjoining the railway right-of-way, as a protection to grain crops, hay land, pasturage and timber lands. Owing to the nature of the ground, it is not always practicable to plow such guards, and in specially selected localities, the Canadian roads are exempted from doing so.

The measures adopted to secure the plowing of the guards vary with the locality. Generally the plowing is contracted for at a stipulated rate per mile or per acre, for a guard eight feet in width. In some locations where fire wood is scarce, the owner of the land through which the guard is to be plowed is willing to do the work in exchange for the old track ties which are removed for replacement. Under such conditions the roadmaster and section foremen must be diplomatic and on friendly terms with the land owners or the work is likely to be unsatisfactory.

On the whole the contract system is the most satis-

factory, as the railway then has a definite contract and can take measures to assure the work being done both satisfactory and on time. There is some added expense to the contract system apart from the rate paid to the contractor, as it is often necessary to supply him with a boarding car outfit in which to live. On the other hand the exchange of old ties has the advantage of being lower in cost, both from the standpoint of the actual cash paid out and the expense in disposing of the ties through burning.

The plowing of the guards should be done at a time when the aftergrowth will be retarded and not cause a fire hazard when it becomes dry. Done in this way, the first plowing lays the foundation for less costly subsequent plowings and discings. It is considered best in this part of the country to start about July 1 and finish by August 15. When working on the basis of paying for the work in old ties, the man in charge of the subdivision is likely to obtain a readier response to his proposal at these times, as the land owners are less likely to be busy with the harvest.

Opinions differ as to the most effective width of fire guards, some inclining to the old width of 16 ft. while others think the present statutory width of 8 ft. is fully effective. It all depends on the maintenance of the guard. Where an 8 ft. guard is kept clean of growth it is, in my opinion, fully as effective as the wider guard. There may be cases where a guard has been given a width of 16 ft., and the aftergrowth is rapid, where the full width will have to be kept clean, but such cases will be rare.

Three successive plowings are usually sufficient to maintain the guard in effective condition if followed in succeeding seasons by discing from two to three times in the one operation.

F. B. TAPLEY,
Engineer, Maintenance of Way, Canadian National, Edmonton, Alta.

The Concrete Mixer for General Work

What is the most suitable size of a concrete mixer for general maintenance and the smaller construction projects?

First Answer

For general use of maintenance of way concrete work and for the smaller construction jobs, it is my opinion that a one-quarter or one-third yard gasoline-driven concrete mixer most nearly fills the requirements. Possibly the one-third yard size is the better as a two bag batch mix is the size most used in the repair work on footings for bents and trestles and culverts and bridge seat repairs. The above sizes have the advantages of flexibility of location and ease of handling in and about trestle and bridges. This is especially so where the line is located in rough country, where the handling of material and equipment is difficult. I favor the gasoline-driven machine for the reason that the equipment is lighter, more compact, and has the further advantage of using a fuel that can be obtained readily in nearly any location and can be easily transported and handled. Getting water for steam-driven machines is a problem in many locations. The question of compactness is worth consideration as it means less cars to carry the equipment necessary for a road gang living in camp outfits.

G. E. TEBBETTS,
General Supervisor, Bridges and Buildings, Chesapeake & Ohio, Richmond, Va.

Second Answer

Some years ago the writer as chairman of a committee on "The Economical Handling of Concrete on Small Jobs" secured information from a large number of different railroads as to their practice. At that time the small size concrete mixers had not been standardized, but the use of a mixer having a capacity of four cubic feet mixed batch was favored for small maintenance work.

If the work is to be handled strictly by ordinary maintenance forces on a division and does not consist of construction projects such as would justify the employment of a regular concrete crew and outfit, then a mixer having four cu. ft. capacity for the mixed batch would be most suitable. A machine of this size, gasoline driven and mounted, weighs about one ton, permitting it to be handled by a small crew and moved from place to place or loaded without difficulty. A half sack of cement forms a convenient basic unit for measuring, and the four-foot mixer accommodates the ordinary mixtures when this unit is employed. The ordinary maintenance job will not exceed 100 cu. yd. and as the four-foot mixer can handle up to 35 or 40 yd. a day, its capacity is ample.

The placing of concrete usually comprises only a fraction of the work to be done, and it is not economy to have the equipment for it out of balance with the outfit needed for the rest of the operations, such as excavation, form building, etc. The disposition of the concrete will govern the output of the machine, and with a maintenance crew of six or seven men receiving bridge carpenters' rates, it is usually possible to secure local laborers to speed up the concreting operations and the mixer used should be such as the ordinary crew can handle if need be.

If the construction in question comprises regular replacements with permanent work, and involves structures of an average size of 200 yd. or more a larger mixer is desirable, and for ordinary cases one with seven cubic foot capacity mixed batch will be most suitable. Such a mixer will use one sack of cement as a charging unit, and can turn out up to 75 cu. yd. of concrete per day. This size mixer will weigh, mounted with engine, about two tons and can be used to best advantage with a crew of from 20 to 25 men, and is ample for general requirements where the work is scattered over the line.

For larger jobs special studies should be made, and equipment selected to fit the individual conditions. On railroad work the cost of moving is an important item especially if work train service is necessary, and it is essential to avoid carrying in the outfit any excess equipment which adds to its dead weight, and is not used to capacity.

L. D. HADWEN,
Assistant Engineer, Chicago, Milwaukee & St. Paul, Chicago.

Mowing the Right of Way

What is the most economical way of mowing the right-of-way?

It is the practice of the Chicago & Alton, before mowing the right of way, for section forces to go over the line and cut the grass and weeds around the telegraph poles with a shovel for a distance of three feet. This costs from 10 cents to 12 cents per pole per year, but is a precaution against fire. Each foreman is then authorized to hire a team for cutting the right-of-way on his section. This work is contracted out at the rate of from $12 to $14 per mile, which has been the price for the last three or four years. Previously it was $10 to $12 per mile. A man with a team and mowing machine will cut a mile of right-of-way per day in 11 hours.

A second man is assigned to go ahead and locate any obstructions such as the ends of ties or wire, any holes or ditches on the right-of-way, to prevent damage to the team and machine. Section foremen with three or four men follow up, cutting in close to the fence line

and mowing this in to the track, so that when the right of way is burned it will not reach the fence line. After the grass and weeds have dried three or four days the foreman turns back and burns the area cut, being very cautious that no weeds or grass are left under the bridges that will draw fire to the piling or frame work. It costs on the average from $25 to $27 a mile for the cutting, skinning and burning of the right-of-way. On my territory there are very few hills to prevent a team from cutting the right of way clean. No bushes are allowed to grow on the right of way that a mowing machine will not cut.

J. P. CORCORAN,
Roadmaster, Chicago & Alton, Bloomington, Ill.

Repairing Water Proofing on Bridge Floors

Is it practicable to make repairs to membrane waterproofing on solid floor bridges without suspending traffic, and if so, how may it be done?

If the repairs to membrane water proofing on solid floor bridges consist of spots where the leaks are well defined the problem is comparatively simple. If the whole surface is required to be re-waterproofed the problem is more difficult but in either case it is practicable to make such repairs.

The method followed on the Chicago & North Western is the result of several years' experience, principally in Chicago and its suburbs, where the traffic is heavy and where its diversion to other tracks temporarily is not to be considered. The ballast is first entirely removed from the deck of the bridge under one track. Lately it has been the practice to screen the ballast as it is removed and pile it up on the shoulder and between tracks off of the bridge. As the ballast is removed the track is supported on short blocking, old bridge ties and short stringers being used for this purpose. The deck is thoroughly broomed and all cracks and expansion joints cleaned out and filled with asphalt joint filler.

The first swabbing coat is started at the end of the bridge, a short section of blocking being removed. This is followed immediately by applying the fabric and protection coat. The work is carried forward in this manner until the center of the bridge is reached. Work is then begun at the other end and carried to the center from that side. In this manner the shingling of fabric is accomplished as on a clear structure.

The protection coat in use consists of cement mortar 1½ in. thick, reinforced with poultry netting. When waterproofing under traffic this protection coat is precast in blocks 18 in. by 24 in., made with bevelled edges. The blocks are laid immediately after the waterproofing is placed and kept up to it at all times so that when it is necessary to replace the blocking to let trains pass the blocking does not rest on the freshly waterproofed surface. The bevelled edges on the protection blocks leave a V-shaped joint which is filled with mortar.

It is necessary, of course, for the foreman to be thoroughly familiar with train schedules, also to protect himself with flagman against unscheduled movements. In order to facilitate the removal and replacement of the blocking, track jacks are used to raise the track slightly. This is also found to facilitate the work by simplifying the removal of some of the track ties.

As soon as one track has been completed, ballast from the adjoining track is removed and placed on the track just completed, at the same time the blocking being taken from track No. 1 and used under the next track. On multiple track bridges it is only necessary to wheel the ballast off of the bridge for one track, afterwards wheeling it back for the last track waterproofed.

Aside from handling the blocking and placing the protection coat, the operation of waterproofing under traffic is no different from any other waterproofing work. More care is required in getting the fabric placed without wrinkles and more men are necessary on account of the jacking work and blocking. Our practice is to use at least 12 men. The cost is about 50 per cent more than when tracks can be removed.

G. A. SAINT,
Assistant Engineer Track Elevation, Chicago & North Western, Chicago.

Manholes for Shop Drainage

Where manholes are built in engine terminal drainage systems should the sewer line be broken at each manhole and a drop provided or should the line be continued through?

First Answer

The question as to whether it is better to have the bottom of the manhole on the floor line of the drain or lower than the drain appears to be one of conditions. If the drainage system is short and has plenty of fall it would probably be better to have the bottom of the manhole at the same grade as the bottom of the drain, while if the drainage system is long and the fall is slight, it is better to make the manhole bottom lower than the drain line in order to reduce the danger of clogging the drain between manholes.

It is the practice on the Pere Marquette to build the manholes in engine terminal drainage systems so that the bottom is 18 in. to 24 in. lower than the drain pipe where it enters the manhole and leaves it. This is partly to keep sediment and dirt from collecting at some inaccessible point and also to make it easy to reach the end of the drain for cleaning between manholes. These manholes are built just outside of the front of the roundhouse and are about 50 ft. apart with a straight run of pipe between them so that rods can be used readily for removing any obstruction that may collect in the line.

J. H. TUTHILL,
Assistant Chief Engineer, Pere Marquette, Detroit, Mich.

Second Answer

In general the drainage system for an engine terminal should be designed in about the same way as that for a municipality with the idea of having a sufficient grade to provide the minimum velocity which will keep the refuse moving. Drainage, especially from an engine house where treated water is in use, is liable to contain considerable heavy scale material and usually the steepest grade which can be secured at reasonable cost should be secured. It is the writer's experience that sewers at engine terminals seldom have sufficient grade to give the required velocity to move the refuse, and frequent cleaning is required. It is therefore quite necessary that manholes be provided at every change in the alinement so that use can be made of sewer rods or other equipment for cleaning.

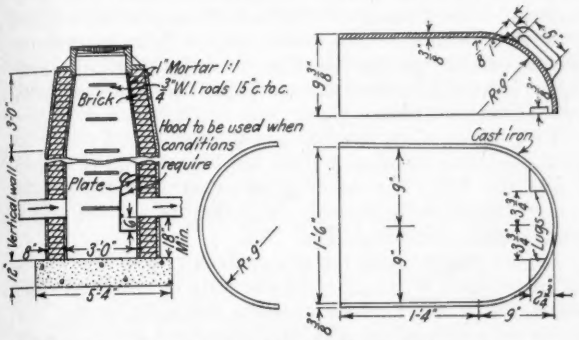
The base of such manholes should be smooth and in line with the bottom of the sewer so as to present no obstruction where debris may lodge. It was formerly a common practice to provide a sump at each manhole, the idea being that debris might lodge there where it could be removed and thus keep the sewer pipe open. This, however, creates an unsanitary condition by reason of the stagnant water and refuse that collects there. Such places also hinder the flow in the sewer. If the sewer is carrying a large quantity of refuse which cannot be allowed to enter a city sewer or drainage ditch an open box, say 6 ft. wide, 16 ft. long and 4 ft. deep, may be provided at the outlet where the sediment may

be collected and the clear water passed off through an opening at the upper edge of the box. Such a sediment box being out in the open, can be seen and easily cleaned out periodically and the refuse thus taken care of at much less expense than by cleaning it out of the sewer.

EDWIN M. GRIME,
Supervisor Bridges & Buildings, Northern Pacific, Fargo, N. D.

Third Answer

I am firmly of the belief that every manhole in an engine terminal drainage system should be of the catch basin type when not carrying sewage. This method of construction provides for a catch basin for refuse which is so prevalent in all engine terminals, and which otherwise would tend to block the line. It has been our



The New York Central Standard Manhole for Shop Drainage With Details of Hood

practice in such instances to provide a basin 3 ft. in diameter, and approximately 18 in. as the minimum distance where possible, below the flow line of the pipe. The plan shown covers the construction which I consider preferable.

R. E. DOUGHERTY,
Designing Engineer, New York Central, New York.

The Responsibilities of the Bridge Foreman*

BY W. W. CASEY

Bridge and Building Foreman, Kansas City Southern, Texarkana, Ark.

DIVISION bridge foremen are assigned to territories averaging about 200 miles of main line and branches, and their duties cover repairs to bridges and trestles, stock pens, platforms, light repairs to buildings, etc. The most important duty and responsibility of the division bridge foreman, however, is to know the physical condition of every bridge and trestle on his division. He should keep these structures before him in such a manner that he will not lose sight of any of them. A certain per cent of these structures come up for renewal each year, and it is very important that these older structures, particularly, be watched closely.

A division bridge foreman should work out of face over his territory two or three times a year, examining all structures and making such repairs as are needed. At the same time he should make a note of the material he will need in his work on these bridges. By doing this, he can arrange for his material before he arrives on the job, and thereby avoid any delay in waiting for it, and be able to utilize all of his time to good advantage. Unless forced by some emergency, a foreman should not leave a bridge until he is satisfied that it is in safe condition for one year.

Line and Surface on Bridges

The maintaining of good line and surface on bridges is an important feature of a division foreman's work. A bent bearing ½ in. low is very easily detected, and in many instances is reported by enginemen. In surfacing, all small built-up shims should be removed and one solid shim put in and spiked securely so that it will not work out from under the bearings. Care should also be taken not to split any shims in spiking or nailing them. Before the stringer drift bolt is re-driven, the shim should be bored through with the proper size of auger to fit the drift. All chord drifts should extend not less than four inches into the caps. Do not drive a drift through a shim without boring it. When it becomes necessary to do any surfacing or lining over the end bents of a bridge, the bridge foreman should always work in conjunction with the section foreman, so that the track approaches can be brought up to meet the line and surface of the bridge. It is to be expected that the dump bents in a bridge will become low in time, and especially if the approaches are not kept in surface with the bridge.

In cases where the piling or footing is on a firm foundation and does not settle and the surface of the approaches become lower than the bridge the bent will receive a hard blow when a train comes on it; this will cause the timbers to crush, particularly if creosoted. The surface on all approaches to bridges should be continued level for at least one rail length from the bridge; the grade should never be allowed to break at the end of a bridge. The foundation is the basis of line and surface on a bridge as well as on the roadbed. If a firm foundation is obtained it will not be difficult to hold the line and surface, but when the surface becomes bad the cause should be determined and corrected quickly.

Foremen Should Co-Operate

Another important duty of a bridge foreman is to co-operate with the section foreman, and the section foreman in turn should co-operate with him. Each section foreman has a duty to perform in watching the bridges on his section, he should give particular attention to the line and surface when passing over bridges, and frequently make an investigation from underneath, looking carefully for broken or crushed timbers. He may feel that he is not competent to make an inspection of the timber in a bridge, but a little confidence, together with the experience he has had in building good track, should enable him to make a reliable inspection to insure the safety of trains.

Whenever unusually bad surface is found on an old bridge, it is generally caused by some timbers giving way. It may be found in piling or a broken post or crushed caps, and in some instances it will be found that the shims on which the stringers bear have crushed or fallen out. It is good practice to inspect all timber under these low spots. If any unsafe condition on a bridge is found by the section foreman, he should immediately protect the bridge by a flagman, until the chief dispatcher is notified. This concerns only cases where a bridge is unsafe for trains—any ordinary light repairs should be reported to the roadmaster.

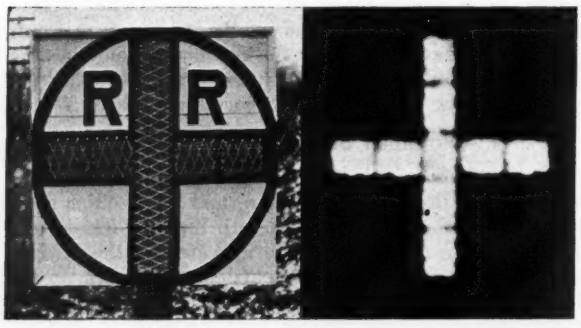
Another duty of a bridge foreman is to look after fire protection facilities on his district. While working over his territory, he should remove all fire hazards around bridges and make the necessary repairs to water barrels, leaving them filled with water. This practice should also be followed by the section foreman.

*Paper presented before a meeting of the Kansas City Southern Maintenance of Way Association at Shreveport, La.

New and Improved Devices

Signs That Shine by Reflected Light

SEVERAL railroads have recently undertaken experiments with what appears to be a distinctly novel development in safety promotional work in the form of a reflecting material adapted for installation on all kinds of stationary railway signs and highway crossing warnings for the purpose of illuminating the signs at night without requiring the use of other light than that projected by the lamps of automobiles or the headlights of trains. The new material is essentially a flat piece of pressed glass with reflecting properties, but unlike the reflector signs now in extended and effective use on many highways in the country, it does not depend for its reflecting power on a large flat polished surface or quicksilver coating, but instead on a flat glass surface, the back of which is pressed into a series of square prisms



A Stimsonite Sign by Day. The Same Sign by Night

each about one-quarter inch in depth and set at an angle of about 45 deg. to the front surface. The result of this construction is to secure the well-known reflecting power of glass prisms and to produce a reflecting surface which will not only reflect back to the source that light which is projected directly toward the face of the glass, but which is equally effective in throwing back light projected from an angle either above, below or to the side of the glass.

In this case the construction of the prismatic surface on the back side of the glass is such as to register with undiminished intensity, light reaching the glass from an angle of as much as 42½ deg., giving a total range of reflection of 85 deg. This serves to qualify the glass for installation on signs which must be placed some distance at the side of a road or above or below the ordinary line of vision.

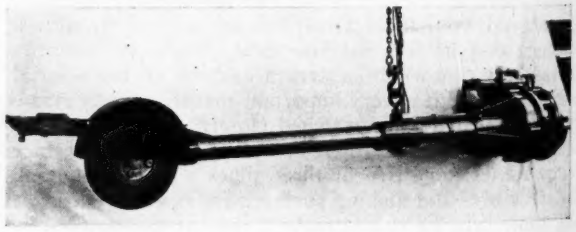
An additional feature of the new development is its manufacture in small sections thus adapting it for use where it is desired to indicate by appropriate symbol at night the nature of the warning. The possibilities in this direction are brought out by the illustrations where a series of reflectors are arranged to form the A. R. A. conventional crossing symbol. The illustrations also serve to suggest the intensity of the reflection secured in actual practice, the night view being only a four second exposure of the sign illumined by normal automobile headlights located 250 ft. distant, the glass in this case being an ordinary uncolored glass.

In practice with normal headlights, the distance of visability with uncolored glass has been found to exceed 1,200 ft. Like any other glass where other than the white indication is desired the reflectors are colored to correspond.

At the present time the new reflector, which is known as Stimsonite, is being tested not only on grade crossing signs but as markers on crossing gates, on center supports, on overhead bridges, etc, prominent among the experimenting roads being the Missouri Pacific, the Rock Island, the Pennsylvania and the Wabash. In all of these installations the reflectors are covered by a protecting screen to prevent breakage of the glass and are so mounted that the glass surface requires only an occasional rain to keep it clean. It is found that no attention need be given to the rear as the accumulation of dust has no effect on the reflecting power of the light from approaching automobiles. Stimsonite is a product of the Stimson Reflector Company, St. Louis, Mo., and it is being introduced on railroads by the Railroad Equipment Company, 491 Arcade Building, St. Louis. Mo.

A Swing Frame Grinder for Frog and Switch Shops

THE MANY phases of frog and switch shop work usually require some form of grinder capable of doing comparatively heavy work while at the same time retaining a measure of portability and flexibility in operation. Working along this line the Diamond Machine Company, Providence, R. I., has recently developed a motor-driven swing-frame grinder for two sizes of grinding-wheels, driven respectively by three and five horsepower electric motors mounted integrally with the frame. The motor is carried on a special end piece, rigidly fastened to the hollow arm in which the driving shaft revolves. Two sizes of grinding-wheel are normally used,

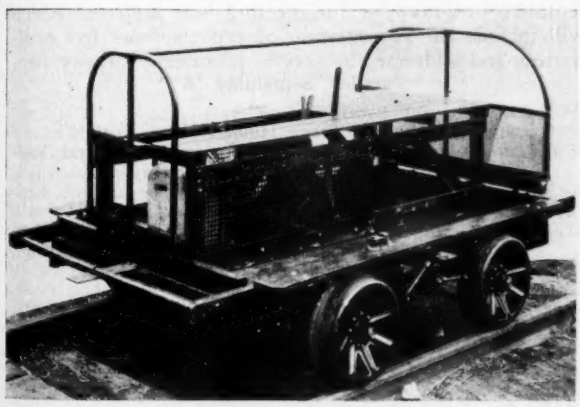


The New Swing Frame Grinder

these being 12 in. in diameter by 2 in. wide and 18 in. diameter by 4 in. wide. The wheel is driven by special bevel gears of nickel steel, fully enclosed and running in oil. Ball-bearings enclosed in dustproof housings are used throughout. A hook is provided at the center of gravity of the machine, by means of which it is usually suspended from an 8 ft. chain hoist hung from a hook in the ceiling of the shop or from the boom of a light jib crane. The current supply wires are brought in close to the hook so as not to interfere with the free movement of the unit. The grinding-wheel is removed by taking off the side plate, the spindle remaining in place and the bearings being completely enclosed. This prevents dirt from entering into the moving parts of the equipment. The wheel head swivels through 90 deg. each side of the vertical position and can be fastened at any desirable angle. The motor is operated by a push button control which is attached to the operator's handle within finger's reach so that the grinder may be started or stopped by the operator as he stands at his work. The operator's handle is adjustable to any position from horizontal upwards to a 45 deg. angle.

High and Low Gear for Mudge Section Car

MUDGE & CO., Chicago, have begun the manufacture of a new form of transmission for use in connection with "All-Service" series of section and extra-gang motor cars which has the effect of enlarging the range of use of any car to which it is applied. The new development is in the form of a



The Mudge All-Service Car Equipped with the New Transmission

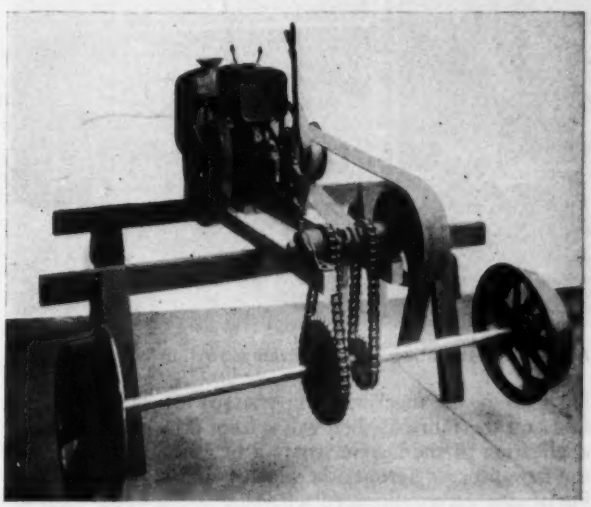
high-and-low gear arrangement, accomplished by providing a secondary shaft between the engine and the drive axle of the car. This secondary or jack shaft is mounted above the car floor immediately over the car axle and, in addition to the drive pulley over which the belt from the engine runs, it carries two sprockets having jaw clutch projections on their inner surfaces. These sprockets run loose on the jack shaft and are connected by over-size roller chains to sprockets, one large and one small, keyed to the driving axle of the car. Between the loose sprockets on the jack shaft is a four-jaw clutch which revolves with the jack shaft but which can be shifted in one direction or the other along the shaft to engage either one of the loose sprockets. This shifting is accomplished by means of a lever within the operator's reach and, obviously, has the effect of throwing the car either into low or high gear, depending upon the direction of shift.

The actual ratio of the gear shift is about one to two, the effect of which for any one speed of the engine is thus to cut the speed of the car one-half or double it as the case may be, but principally to afford the means of practically doubling the power at any one speed of engine. This gear shift does not alter the

The High and Low Gear Transmission Proves Useful in Handling Heavy Loads

ability of the engine itself to be run at different speeds so that with the variable speed engine and the high and low gear transmission an arrangement is provided which, while simple, is also suited to a wide variation in speed in either direction. Where special conditions of work require, it is also possible to alter the driving ratio by substituting a different size pulley on the jack shaft.

The main objective in developing the new transmission was to provide a motor car suited to ordinary section work and which at the same time could be utilized for extra heavy work such as usually requires an extra heavy car. Cars equipped with this transmission are in service at the present time and are reported to be giving satisfactory results in a wide variety of work. In one case a load of 22,900 lb. was handled, con-



A View of the New Transmission

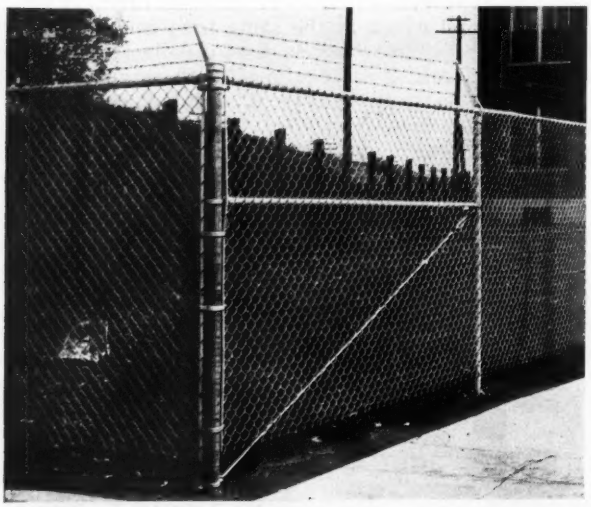
sisting of 100 creosoted ties weighing 185 lb. each, carried on two push cars, spanned by two 33-ft. steel rails upon which the ties were carried in addition to 9 men and the motor car. On arriving at the destination the car was operated at a speed as low as 2½ miles an hour while the section men distributed the ties along the track. The high and low transmission has proved particularly useful where heavy grades are encountered by reason of the extra power afforded by simply shifting the clutch.

As a result of the service obtained from new cars equipped with the transmission and of cars previously in service to which the transmission has been applied the manufacturer has discontinued the manufacture of heavier cars.

An additional feature of the new development is the endless molded belt used which requires no belt lacing but simply the shifting of the engine on its base to take up any stretch or to loosen the belt where desired. Keeping the entire belt above the floor of the car is also considered a beneficial feature of the new arrangement by reason of the protection afforded from any dampness under the car resulting from striking wet weeds, etc.

Page Wire Company Modifies Its Galvanizing Process

AMONG recent developments in the manufacture of fencing is the announcement of the Page Steel & Wire Company, Bridgeport, Conn., of its adoption of a modified process of galvanizing that is claimed to treble the life of its woven wire fence. The process is that of galvanizing the fence after weaving as distinguished from the process formerly adhered to in wire fence manufacture of first galvanizing the wire and then weaving it into fence. Because of the numerous mechanical operations involved in the weaving process, this method of construction limits the thickness of zinc coating which can be applied and relied upon to remain intact after the wire is placed in service. In the galvanizing-after-weaving method the mechanical operations are all performed first and the fabric is then galvanized, thus permitting the application of the heavier coating of zinc. It is said that the new process permits the placing of a protective coating of zinc on a fabricated wire that is five times heavier than that on the ordinary galvanized fence. The claim that the new process of galvanizing trebles the life of the woven wire link fence is based on experiments conducted over a series of years including a wire bearing the thickness of coating applied by the new method which has already successfully withstood exposure in New England for more than seven years. The principal effect of trebling the life of fence is of course to reduce materially the service cost. It is the intention of the company to use this method in the manufacture of all of its types of wire-link fence.



A Recent Installation of the Galvanized-After-Weaving Fence

With the Associations

Wood Preservers' Association

THE proceedings of the twenty-first annual convention have been completed by the printers and are now going into the mail. Different from the practice in past years, this volume has been put to press without waiting for the statistical section which is compiled in co-operation with the United States Forest Service. This section will follow later in a separate volume.

The Roadmasters' Association

THE Executive Committee of the Roadmasters' Association held a meeting with the chairmen of committees at Chicago on July 12 at which plans were considered for the convention which will be held at the Commodore Hotel, New York, on September 16-18. A tentative program for the meeting was prepared which will include the presentation of reports from five committees and addresses by several prominent railway men.

Tuesday, September 16

9:30 a. m.	Convention called to order.
9:40 a. m.	Address by Murray Hulbert, New York City.
10:00 a. m.	Address by C. R. Besler, president, Central Railroad of New Jersey, New York City.
10:30 a. m.	President's address.
10:45 a. m.	Appointment of committees.
11:00 a. m.	Report of Committee on Work Trains: When to Eliminate and How to Get the Greatest Efficiency, D. K. Newmyer (Sou. Pac.), chairman.
12:30 p. m.	Adjournment.
2:00 p. m.	Report of Committee on Handling and Disposing of Cinders, H. R. Clark (C. B. & Q.), chairman.
3:00 p. m.	Address by Julius Kruttschnitt, chairman of Executive Committee, Southern Pacific, New York City.
4:00 p. m.	Paper on "Brands and Marks on Rails and Their Meaning," by C. W. Gennet, Jr., Robert W. Hunt Company, Chicago.
5:00 p. m.	Adjournment.
	Business session on boat trip.

Wednesday

9:30 a. m.	Report of Committee on Rail Laying and Ballasting Track under Single Track Operation, R. H. Smith (N. & W.), chairman.
10:45 a. m.	Address by R. H. Aishton, president, American Railway Association, Chicago.
11:30 a. m.	Paper on "Programming Maintenance Work on Sections," by G. M. O'Rourke, roadmaster, Illinois Central, Carbondale, Ill.
12:30 p. m.	Adjournment.
2:00 p. m.	Report of Committee on Methods of Increasing Output of Labor, A. E. Preble (Penna.), chairman.
3:00 p. m.	Address by C. L. Bardo, general manager, New York, New Haven & Hartford, New Haven, Conn.
4:00 p. m.	Adjourn to visit Track Supply Exhibit.
6:30 p. m.	Annual dinner of the Roadmasters' and Track Track Supply Associations.

Thursday

9:00 a. m.	Report of Committee on Possibilities of Winter Track Work, E. C. Buhrer (T. & O. C.), chairman.

10:00 a. m. Business session.
Reports of officers and committees.
Election of officers.
Selection of meeting place for next convention.
Installation of officers.
11:30 a. m. Adjournment.
1:30 p. m. Inspection trip.

The plans of the Track Supply Association indicate that the scope of the exhibit will exceed that of any previous year. A total of 51 firms have already made arrangements for exhibit space as follows:

American Chain Company, Bridgeport, Conn.
American Hoist & Derrick Company, St. Paul, Minn.
American Steel & Wire Company, Chicago.
American Valve & Meter Company, Cincinnati, Ohio.
Balkwill Manganese Crossing Company, Cleveland, Ohio.
Bethlehem Steel Company, Bethlehem, Pa.
Buda Company, Chicago.
Chicago Malleable Castings Company, Chicago.
Chipman Chemical Engineering Company, Inc., New York City.
Cleveland Railway Supply Company, Cleveland, Ohio.
Creepcheck Company, Inc., Hoboken, N. J.
Crerar Adams Company, Chicago.
Duff Manufacturing Company, Pittsburgh, Pa.
Elliot Frog & Switch Company, East St. Louis, Ill.
Fairbanks, Morse & Co., Chicago.
Fairmont Railways Motors, Inc., Fairmont, Minn.
J. R. Fleming & Son Company, Scranton, Pa.
Hauck Manufacturing Company, Brooklyn, N. Y.
Hayes Track Appliance Company, Richmond, Ind.
Headley Good Roads Company, Philadelphia, Pa.
Hubbard & Company, Pittsburgh, Pa.
Ingersoll Rand Company, New York City.
O. F. Jordan Company, East Chicago, Ind.
Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Lundie Engineering Corporation, New York City.
Maintenance Equipment Company, Chicago.
Mudge & Company, Chicago.
National Lock Washer Company, Newark, N. J.
Northwestern Motor Company, Eau Claire, Wis.
Oxweld Railroad Service Company, Chicago.
P. & M. Company, Chicago.
Pocket List of Railroad Officials, New York City.
Positive Rail Anchor Company, Marion, Ind.
Q. & C. Company, New York City.
Rail Joint Company, New York City.
Railroad Supply Company, Chicago.
Railway Engineering and Maintenance, Chicago.
Railway Review, Chicago.
Ramapo Ajax Corporation, Hillburn, N. Y.
Reade Manufacturing Company, Jersey City, N. J.
Reliance Manufacturing Company, Massillon, Ohio.
Safety Appliance Sales Company, Chattanooga, Tenn.
Sellers Manufacturing Company, Chicago.
Templeton, Kenly & Co., Ltd., Chicago.
Track Specialties Company, Inc., New York City.
Union Switch & Signal Company, Swissvale, Pa.
Verona Tool Works, Pittsburgh, Pa.
Warren Tool & Forge Company, Warren, Ohio.
William Wharton, Jr., & Co., Inc., Easton, Pa.
Woolery Machine Company, Minneapolis, Minn.
Wyoming Shovel Works, Wyoming, Pa.

The Material Market

THE unfilled orders of the United States Steel Corporation on June 30, 1924, totaled 3,262,505 tons, a quantity which is less than at any previous date since May, 1911. While this represents an important evidence of business depression, it should be considered in the light of another important fact, namely, that the rate of production of steel continues in larger volume than during previous periods when orders on hand were low. Thus in June the production of steel ingots averaged 82,000 tons per day while in July, 1921, when orders on hand were far greater than now production averaged only 35,000 tons per day. Another contrast with this situation is to be found in the larger volume of orders for structural steel during June than for several months previous. The June total, 171,600 tons, represents about 66 per cent of capacity. It is also to be noted that the orders placed for structural steel during the first half of 1924, 1,050,000 tons, total only 65,000 tons less than the bookings for the first half of 1923.

Viewing the iron and steel market from the standpoint of prices, one finds that further reductions have taken place during the past month. Almost no change is to be noted in track materials but the prices for wire items are lower and these have been reflected in an increase in discounts on woven wire fencing. Structural material, namely, plates, shapes and bars, have also experienced some shading in prices. These changes will be noted in the table below.

PRICES PER 100 POUNDS.

	June 20.		July 20.	
	Pittsburgh.	Chicago.	Pittsburgh.	Chicago.
Track spikes	$2.90 to $3.00	$3.10	$2.90	$3.10
Track bolts	3.75 4.25	4.10	3.75 to 4.00	4.10
Angle bars		2.75	2.75	2.75
Tie plates, steel	2.50 to 2.55	2.60	2.50 to 2.55	2.60
Boat spikes	3.25 to 3.40	$3.59 to 3.74	3.25 to 3.40	$3.59 to 3.74
Plain wire		2.65	2.99	2.60	2.99
Wire nails	2.85 to 2.90	3.19 to 3.24	2.85	3.19
Barbed wire, galv.		3.70	4.04	3.60	3.94
C. I. pipe, 6 in. to 12 in., per ton			54.70		55.20
Plates	2.15 to 2.20	2.30 to 2.35	2.15	2.25 to 2.35
Shapes		2.20	2.35	2.15	2.25 to 2.35
Bars, soft steel		2.20	2.20 to 2.25	2.15	2.15 to 2.25
Rivets, structural	2.65 to 2.75			2.60	
Open hearth rails, per gross ton, f. o. b. mills					43.00

In contrast with the price tendencies for new material attention must be directed to a moderate increase in the quotations for scrap items of interest to the railway track department. This tendency is rather general throughout the entire scrap market.

PRICES PER GROSS TON AT CHICAGO.

	June.	July.
Relaying rails	$27.00 to $32.00	$27.00 to $32.00
Rails for rerolling	14.75 to 15.25	15.50 to 16.00
Rails less than 3 ft. long	16.00 to 16.50	17.00 to 17.50
Frogs and switches cut apart	13.50 to 14.00	15.50 to 16.00
Steel angle bars	15.00 to 15.50	16.00 to 16.50

Conditions in the lumber market indicate no appreciable changes from a month ago. Prices are somewhat lower but no marked changes are to be noted with respect to production and demand. The volume of orders in the hands of the Southern pine mills is only slightly smaller than at the corresponding time last year. This however, is not the case on the west coast where cargo domestic orders on hand at the end of the first 27 weeks of 1924 totaled only about 75 per cent as much as for the corresponding period of last year, whereas rail orders were only 49 per cent as much. These conditions are reflected in moderate reductions in the prices as shown in the table below.

SOUTHERN PINE MILL PRICES.

	June.	July.
Flooring, 1x4, B and B flat	$40.45	$39.75
Boards, 1x8, No. 1	33.90	32.20
Dimension, 2x4, 16, No. 1, common	26.00	27.55
Dimension, 2x10, 16, No. 1, common	27.45	25.30
Timbers, 4x4 to 8x8, No. 1	27.40	25.40
Timbers, 3x12 to 12x12, rough	34.40	34.80

DOUGLAS FIR MILL PRICES.

Flooring, 1x4, No. 2, clear flat	$35.00	.....
Boards, 1x8, 6 to 20, No. 1, common	16.50	$15.50
Dimension, 2x4, 16, No. 1, common	16.50	15.50
Dimension, 2x10, 16, No. 1, common	16.00	15.00
Timbers, 6x6 to 8x8, No. 1, common	23.00	23.00
Timbers, 10x10 to 12x12, rough	18.00	17.00

No important changes have been reported recently in Portland cement. Following are quotations per barrel in carload lots, not including package, f. o. b. the cities listed.

New York	$2.15	Minneapolis	$2.41
Pittsburgh	2.19	Kansas City	2.27
Atlanta	2.35	Dallas	2.05
Chicago	2.20	Denver	2.84
Cincinnati	2.47	San Francisco	2.61

GREAT MATHEMATICIAN DIES.—Benjamin G. Lamme, chief engineer of the Westinghouse Electric & Manufacturing Company, an electrical genius and inventor of note and recognized as the greatest living mathematician, died on July 8.

News of the Month

The number of motor vehicles registered in the United States at the close of 1923 was 15,092,177 while the production during the year was 4,012,873. In 1918 the number of cars registered numbered 6,146,617.

In a lawsuit brought by a trackman for injuries incurred from slipping on a wet cross tie, a Texas court held that where the trackman was engaged in the usual course of his work of unloading cross ties and was injured by slipping on a wet creosoted tie which he knew to be slippery, the railroad was relieved from any liability.

The Southern Pacific has applied to the Interstate Commerce Commission for authority to acquire all the assets and property of the El Paso & Southwestern which, if carried out, will obviate the need of constructing extensive second track and will result in the construction of 172½ miles of new line in Arizona, to build which authority has also been sought.

The Department of Forest and Waters of Pennsylvania has published a statement showing the estimated damage resulting from 1,147 forest fires occurring in that state during the year 1923, each one of which is said to have been caused by a railroad. The total estimated area covered by the fires was 107,447 acres and the estimated damage $205,277, while the state expended $39,471 for extinguishing the fires.

John H. Dunlap, secretary, American Society of Civil Engineers, died in Chicago on July 29, from injuries sustained on June 30, in the railway wreck occurring near Buda, Ill., when an eastbound mail train of the Chicago, Burlington & Quincy, collided with the rear end of a passenger train from Denver in which Mr. Dunlap was traveling. Mr. Dunlap suffered spinal injuries from which it was at first hoped he would recover.

The United States Circuit Court of Appeals at Philadelphia has dismissed a suit brought against the Pennsylvania by the System Federation of Shops Craftsmen and the clerks' brotherhood to enforce increases in wages which is claimed not to have been made n compliance with decisions of the Railway Labor Board calling for the continuance of rates of wages which were paid by the U. S. Railroad Administration. The sum of $15,000,000 was the estimated difference between what the employees have received from the company and what they would have received under the higher rates claimed.

Three large railroads, according to a statement brought out at a recent sectional meeting of members of the Railway Fire Protective Association, have introduced electric extension cord lights in roundhouses with a rule forbidding the use of torches, while two other roads using torches require them to be kept in charge of the custodian of the toolroom. It was also stated that recent tests of sprinkler heads have led to the renewal of thousands of these fittings because of unsatisfactory conditions, one large railroad having installed over 10,000 of a coated type while other designs have been introduced with a view to preventing corrosion.

The most serious wreck of recent months occurred on the Chicago, Burlington & Quincy, on June 30, when a fast mail train from the west collided with the rear end of a limited passenger train from Colorado shortly after the latter train had stopped at Buda, Ill., for coal. The accident resulted in the death of eight persons and the injury of eleven others, all but one of which casualties were suffered by persons riding in the only all-wooden car of the train, which was crushed by the impact. A failure of the engineer to observe signals together with an obstruction to view created by the presence of a 68-car freight train on one track near the scene of the wreck were reported to have been the contributing causes.

Revenue freight car loading for the week ended July 5, the last week of record, totaled 759,942 cars, as compared with 806,082 cars in the corresponding week of 1923, and 707,025 cars in 1922. The decrease, as compared with the preceding week, was due to the holiday on July 4. As compared with the corresponding week of last year, decreases were shown in the loading of all classes of commodities except grain and grain products and live stock, and in all districts except the southwestern. The freight car surplus for the period from June 23 to June 30 averaged 356,389 cars, including 153,550 box cars and 162,343 coal cars. This was a decrease as compared with the previous week of 3,255 cars.

Records of equipment conditions show that there are a larger number of locomotives and freight cars in good condition and ready for service at present than there were a year ago. In April, the latest month for which statistics are available, the total number of freight locomotives was 33,067 or only 104 more than the year before. The number in serviceable condition, however, was 26,726 or 1,593 more than the year before, and the number stored was 4,162 or 3,322 more than the year before. The number of freight cars on lines on June 15 was about 30,000 more than the year before and the number in bad order was slightly less, the result being that the number now available in serviceable condition is approximately 40,000 more than a year ago.

The Pan-American Railway Committee, reorganized by the governing board of the Pan-American Union in accordance with the terms of a resolution adopted at the fifth international conference of American states held in Santiago, Chile, in 1923, met for the first time at the Pan-American Union on Monday, July 7, and considered as one of its first subjects the route of a railway that shall connect New York and Buenos Aires. The original report of the Intercontinental Railway Commission, created by the first international conference of American states, recommended that this line, after passing through Mexico and Central America, should traverse the western highlands of South America until it reached southern Peru, where it should turn southeastward through Bolivia and Argentina. Within recent years, however, attention has been given to plans for a line passing east of the Andes and avoiding the mountainous regions.

Operating revenues of the Class I railroads representing a mileage of 235,997 miles totaled $477,229,000 in May, according to the Bureau of Railway Economics, which is a decrease of 12.9 per cent as compared with the same month of last year. The operating expenses totaled $381,253,200 which is a decrease of 9.5 per cent. For the first five months of the year, the Class I railroads are shown to have had a net operating income equivalent to an annual rate of return of 4.27 per cent on the property investment as compared with 4.98 per cent for the same period of last year. Forty Class I carriers of which 22 roads were in the west operated at a loss in May. Maintenance expenses in May, 1924, for both equipment and roadway totaled $178,656,563, which is nearly 11 per cent under those of May, 1923, while the figure for the first five months of 1924 is a reduction of nearly 6 per cent over the expenses for the same period last year.

Personal Mention

General

Robert T. Morrow, formerly in the maintenance of way department of the Pennsylvania, has been promoted to assistant to the vice-president of the Central region of the Pennsylvania, with headquarters at Pittsburgh, Pa. He was born on March 2, 1859, at Oswego, N. Y., and was educated at Lehigh University. He entered railway service in 1876 in the shops of the Northern Central (now the Pennsylvania) at Elmira, N. Y. and from 1878 to 1882 he attended college immediately following which he was employed as rodman on the Philadelphia & Erie (now a part of the Pennsylvania). A year later he was appointed assistant supervisor of the eastern division of the same road and held this position until 1885, when he was promoted to supervisor. In 1893 he was appointed assistant engineer, in which position he served a number of other companies now comprising the Pennsylvania until 1901 when he became assistant superintendent of the Pittsburgh division of the Pennsylvania. He was advanced to superintendent of the Western Pennsylvania division at Pittsburgh in 1903 and was serving in this capacity at Pittsburgh at the time of his promotion to assistant to the vice-president.

Robert T. Morrow

Engineering

William Willoughby has been appointed assistant engineer on the Florida East Coast with headquarters at New Smyrna, Fla.

C. S. Johnson has been appointed bridge engineer of the Wabash, with headquarters at St. Louis, Mo., a newly created position.

Harold Tubbs has been appointed assistant engineer of the Toledo-Ludington division of the Pere Marquette, with headquarters at Saginaw, Mich., to succeed **N. D. Wilkins,** deceased.

C. S. Robinson, general supervisor, maintenance of way, on the Maine Central with headquarters at Portland, Me., has been promoted to engineer maintenance of way with the same headquarters, succeeding **G. F. Black,** who has retired.

H. J. Shaw, assistant division engineer on the Central region of the Pennsylvania, with headquarters at Cambridge, Ohio, has been promoted to division engineer of the Akron division, with headquarters at Akron, Ohio, to succeed **T. E. Nestor,** who has been transferred to the Conemaugh division, with headquarters at Pittsburgh, Pa., to succeed **C. W. Richey,** whose appointment as division engineer on the staff of the general manager at Pittsburgh, was noted in the July issue.

J. R. Hoagland, whose promotion to valuation engineer of the Chicago & Alton, with headquarters at Chicago, was announced in the June issue, was born in 1882 at Idaville, Ind., and graduated from Purdue University in 1906. He entered railway service in the summer of 1905 as a rodman on the Pennsylvania, and joined the engineering forces of the Chicago & Alton as an assistant engineer in 1909, where he was later chief pilot engineer until 1911 when he was placed in charge of track elevation work in Chicago. He continued in charge of various construction work in Chicago until its completion in 1910 when he engaged in valuation work.

Frank A. Merrill, engineer maintenance of way of the Boston & Maine, with headquarters at Boston, Mass., has also been appointed chief engineer, succeeding **Arthur B. Corthell,** deceased, the engineering and maintenance of way departments having been combined. Mr. Merrill began railroad work on the Concord & Montreal and was serving as chief engineer of that road when it became part of the Boston & Maine. He continued in the service of the Boston & Maine as division engineer and was later appointed assistant chief engineer. In 1914 he became engineer maintenance of way serving in that position until his recent promotion.

Robert H. Parke, assistant division engineer on the Fitchburg division of the Boston & Maine has been promoted to division engineer on the same division, with headquarters at Fitchburg, Mass., succeeding **James L. Shank,** deceased, as noted elsewhere in these columns. Mr. Parke was born at Monson, Mass., on June 22, 1876, and entered railway service as an instrumentman on the Boston & Maine at Fitchburg in September 1899. He subsequently served in various engineering capacities until April, 1915, when he was promoted to assistant division engineer on the Fitchburg division, the position which he held at the time of his recent promotion to division engineer.

W. B. Hodge, whose promotion to engineer maintenance of way of the Indianapolis terminal and Springfield divisions of the Cleveland, Cincinnati, Chicago & St. Louis Railway, was reported in the July issue, was born on January 13, 1887, near De Graff, Ohio, and was educated at Ohio Northern university from which he graduated in 1910. Immediately following his graduation he entered railway service as chainman on the Big Four at Galion, Ohio, and served as chainman and instrumentman at various points until 1912, when he was promoted to assistant engineer on the Michigan division at Wabash, Ind. He was engaged as assistant engineer at Wabash, Ind., at Indianapolis and on the Chicago divisions until 1917 when he entered the construction department as a resident engineer on track elevation work at Indianapolis, Ind. He was transferred to Dayton, Ohio, in 1918 as resident engineer on track relocation work in the vicinity of Dayton, Ohio, necessitated by flood conservancy work in that district, following which he became assistant engineer on the Cincinnati division. In 1921 he was transferred to the office of the chief engineer at Cincinnati, Ohio, where in 1923 he became office engineer, the position he was holding at th time of his recent promotion.

Track

F. R. Harrison has been appointed assistant supervisor of track on the Central of Georgia, with headquarters at Columbus, Ga., a newly created position.

Nels Hovine has been appointed district roadmaster on the Spokane division of the Great Northern, with headquarters at Hillyard, Wash., to succeed **Iver Nelson,** granted leave of absence.

John H. Broome, track foreman on the Louisville & Nashville at Chipley, Fla., has been promoted to supervisor of track at Selma, to succeed **J. D. Hall,** who has been transferred to De Suniak Springs, Fla., following the death of **M. A. Warren.**

Michael Sullivan has been promoted to supervisor of track on the New York, New Haven & Hartford, with headquarters at Providence, R. I., succeeding **Reuben Armstrong,** transferred to succeed **George Boler.** Mr. Armstrong's headquarters will be at Providence as formerly.

H. W. Stetson, roadmaster on the Maine Central with headquarters at Lewiston, Me., has been promoted to general supervisor, maintenance of way, with headquarters at Portland, Me., succeeding **C. S. Robinson,** promoted to engineer maintenance of way as noted elsewhere in these columns. **L. P. Chick** has been appointed assistant roadmaster with headquarters at Brunswick, Me., succeeding **J. F. Collins,** promoted to roadmaster with headquarters at Lancaster, Me., to succeed **L. F. Brean,** transferred to Rumford, Me., succeeding

J. P. Scully, who has been transferred to Lewiston to succeed Mr. Stetson.

W. M. McCoy, whose promotion to supervisor of track of the Indianapolis division of the Pennsylvania, Southwestern region, was noted in the July issue, was born on May 21, 1886, at Bloomfield, Ind., and entered railway service on August 16, 1906, as a trackman on the Pennsylvania. He was promoted to track foreman on December 15, 1911, and on June 16, 1916, was advanced to extra gang foreman, which was the position he was holding at the time of his recent promotion to supervisor of track at Bicknell, Ind.

John Esse, track foreman on the Union Pacific at Bufford, Wyo., has been promoted to roadmaster, with headquarters at Evanston, Wyo., succeeding **A. Thompson,** who has been assigned to other duties. **J. H. Stickler,** roadmaster at Rawlins, Wyo., has been transferred to Rock Springs, Wyo., to succeed **A. Scott,** who has been assigned to other duties, and **L. J. Overman,** general roadmaster at Cheyenne, Wyo., has been transferred to Green River, Wyo., to succeed **O. C. Wilkes,** who has been transferred.

J. L. Huston, whose promotion to roadmaster on the Southern Pacific was reported in the July issue, was born on July 22, 1879, at Corning, Calif., and entered railway service on December 14, 1906, as an assistant foreman on the Southern Pacific. He was advanced to section foreman on February 1, 1907, and served as extra gang foreman until June 23, 1911, when he was transferred to the Coast division. On October 31, 1914, he was appointed extra gang foreman on the Los Angeles division and was serving in this capacity at the time of his promotion to roadmaster.

B. C. Hanna, assistant engineer on the Mobile & Ohio, at Tuscaloosa, Ala., has been promoted to supervisor of track, with the same headquarters. Mr. Hanna was born on August 15, 1898, at Prescott, Ark., and studied at Alabama Polytechnic Institute, from which he received the degree of civil engineer in 1921. He entered railway service in March, 1918, as a draftsman in the architect's office of the Mobile & Ohio, and became assistant engineer in May, 1923, in charge of the construction of new shops and yard facilities at Jackson, Tenn., where he remained until his recent promotion to track supervisor of the Montgomery district.

J. T. Moon, track supervisor on the Southern, with headquarters at Rome, Ga., has been promoted to roadmaster, with headquarters at Hattiesburg, Miss., to succeed **N. H. Self,** who has been transferred to Birmingham, Ala., to succeed **M. W. Self,** who has been transferred to Somerset, Ky., to succeed **A. P. New,** resigned. Mr. Moon was born on February 12, 1892 at Lynchburg, Va., and entered railway service in 1914 as a student roadway apprentice at Bremen, Ga. He was promoted to assistant supervisor of track at Rome, Ga., on March 1, 1916, and was advanced to supervisor of track, with headquarters at the same place in November, 1920, since which time he has continued in the same capacity until his recent promotion to roadmaster.

W. W. Irving, whose promotion to roadmaster on the Kansas, Oklahoma & Gulf, with headquarters at Allen, Okla., was reported in the June issue, was born in Scotland in 1877 and entered railway service on January 15, 1902, as roadmaster's clerk on the Missouri Pacific at Van Buren, Ark. From February, 1904, to 1908, he served as chief road clerk and chief clerk to the division engineer at Kansas City, Mo., and as chief clerk to the division engineer at Omaha, Neb., and assistant chief clerk to the general superintendent at Kansas City. Leaving the Missouri Pacific in 1908, he became chief clerk to the division engineer on the Chesapeake & Ohio and continued in this capacity until 1918 when he was appointed chief clerk to the chief engineer of the Kansas, Oklahoma & Gulf, which position he was holding at the time of his recent promotion to roadmaster.

Bridge and Building

J. H. Johnson, carpenter foreman on the Central region of the Pennsylvania, has been promoted to master carpenter, with headquarters at Wellsville, Ohio.

George Higgins has been promoted to supervisor of bridges and buildings of the Chicago-Petoskey division of the Pere Marquette, to succeed **Adam McNab. A. L. McCloy** has been promoted to supervisor of water service of the Toledo-Ludington division, to succeed **J. Frank Luxton,** resigned.

Austin D. Gillis, district foreman on the New York, New Haven & Hartford, has been promoted to supervisor of bridges and buildings with headquarters at Providence, R. I., succeeding **J. W. Smith,** transferred. Mr. Gillis was born on Prince Edward Island, Canada, on June 11, 1883, and entered railway service in the bridge and building department of the New York, New Haven & Hartford on December 8, 1906, where he served in various capacities until May, 1915, when he was promoted to bridge and building foreman. In August, 1917, he was promoted to district foreman, the position he held at the time of his recent promotion as noted above.

M. A. Youngblood, whose promotion to supervisor of bridges and buildings on the Yazoo & Mississippi Valley was noted in the July issue was born on May 13, 1884, at Durant, Miss., and entered railway service in 1901 as a bridge carpenter on the Mississippi division of the Illinois Central. He was promoted to assistant foreman in 1904 and continued as assistant foreman on the Mississippi division and later on the Vicksburg division of the Yazoo & Mississippi Valley until 1910, when he was appointed a foreman of a fence gang. He was promoted to bridge foreman on the Vicksburg division in July, 1912, and continued in this capacity on the Yazoo & Mississippi Valley until his recent promotion to supervisor of bridges and buildings with headquarters at Greenville, Miss.

Purchases and Stores

Frank T. Swain has been appointed assistant purchasing agent of the Lehigh & New England.

J. W. Kelleher has succeeded **T. H. Ryan** as purchasing agent of the Alabama & Vicksburg, with headquarters at New Orleans, La.

Ed. Hoffman, assistant purchasing agent of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., has been promoted to general purchasing agent, succeeding **J. D. McCarthy,** resigned to become associated with the Republic Coal & Coke Company, Chicago.

E. J. McVeigh, general storekeeper of the Central region of the Canadian National, with headquarters at Toronto, Ont., has been appointed superintendent of reclamation and scrap, with headquarters at Montreal, Que., a newly created position. **E. D. Toye,** assistant general storekeeper of the Central region, with headquarters at Toronto, has been promoted to general storekeeper, with the same headquarters, succeeding Mr. McVeigh. **W. B. Gordon,** district storekeeper, with headquarters at Montreal, has been promoted to assistant general storekeeper, with headquarters at Toronto, succeeding Mr. Toye.

Obituary

John C. Trautwine, Jr., a collaborator with his father in the editing of the widely-known "Civil Engineers' Pocket Book," died at Philadelphia on July 4. Mr. Trautwine was born on March 17, 1850, at Philadelphia.

Louis H. Long, who on account of ill health, retired in 1921 as vice-president of the Southern Pacific of Mexico and the Arizona Eastern, died in Santa Barbara, Calif., on July 6, 1924, at the age of 60 years. Mr. Long served for many years as an assistant to William Hood, formerly chief engineer of the Southern Pacific.

James L. Shanks, division engineer on the Boston & Maine with headquarters at Fitchburg, Mass., died on July 5 at his home in North Leominster, Mass. Mr. Shanks was born at Windsor Mills, Que., Canada, on December 5, 1859, and entered railway service as a track laborer at Millers Falls, Mass., on the Boston & Maine on April 30, 1877. In February, 1881, he was promoted to section foreman and in October, 1887, to roadmaster of the Troy branch, his jurisdiction being later extended to Greenfield, Mass. In November, 1900, he was promoted to general roadmaster of the Fitchburg division, serving in this capacity until November, 1911, when he was promoted to division engineer which position he held until his death.

Construction News

The American Railway Express Company plans the construction of a 135-ft. by 40-ft. brick express depot at Alliance, Ohio, to cost approximately $30,000.

The Arizona Eastern has applied to the Interstate Commerce Commission for authority to construct 172.5 miles of line in Arizona, including a new main line from a connection with the Southern Pacific at Picacho to a connection with the Arizona Eastern at Chandler, 50.5 miles; a branch line leaving this line at the crossing of the Gila river and extending to a point on the north bank of the Gila river opposite Florence, 7 miles; and a new main line connecting with the Arizona Eastern at Hassayampa and extending to a connection with the Southern Pacific at Dome, 115 miles.

The Atchison, Topeka & Santa Fe has awarded a contract to the Lynch Construction Company, Los Angeles, Cal., for the construction of two additions to its locomotive shops at San Bernardino, Cal. The additions will be 100 ft. by 194 ft. and 45 ft. by 180 ft., respectively. This road has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 300-ton reinforced concrete locomotive coaling and sanding plant at Colorado Springs, Colo.

This company has completed plans for the construction of a passenger station at Canyon, Tex., of steel and concrete construction, with stucco and brick finish and a tile roof to cost approximately $65,000.

The Atlantic Coast Line has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 150-ton reinforced concrete coaling station at Fort Meyers, Fla.

The Baltimore & Ohio has purchased land in the vicinity of East St. Louis, Ill., for the development of a new terminal, the total cost of which will ultimately be $9,973,000. The terminal will include a westbound receiving yard with a capacity of 1,000 cars, an eastbound receiving yard with a capacity of 800 cars, classification and adyance yards with a total capacity of 3,000 cars and other tracks to make the total capacity of the terminal 6,650 cars. The engine terminal will include two engine houses, each with 21 stalls, a machine shop, power house, coaling station, water tanks, ash pits and sanding facilities. In addition, the relocation of the main line from Caseyville, Ill., to Furman is planned. The site of the terminal is now being filled in and tracks laid preliminary to undertaking the entire project at a later date.

This company has awarded a contract to the Vang Construction Company, Cumberland, Md., for the construction of a bridge over the Pennsylvania Railroad, a creek and a highway at Snowden, Pa. The structure will consist of an 18-ft arch and a 40-ft. arch. The Pennsylvania will share in the cost of the work. This company has awarded a contract to the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., for the construction of a water-treating plant at Bridgeport, Ohio, to cost approximately $25,000, and is calling for bids for a water treating tank and mixing equipment for installation at Ottawa, Ohio.

The Calumet & Hecla Consolidated Copper Company has awarded a contract to J. A. Roberts Bros., Chicago, for the construction of 10 miles of single track railroad near Calumet, Mich.

The Canadian Pacific has awarded a contract to Rosen & Wickstrand, Regina, Sask., for the grading of the new line from Leader, Sask., to a point 25 miles east, noted in the July issue, and has awarded a contract to W. A. Dutton & Sons, Winnipeg, Man., for the grading of 25 miles of a branch line from Kipp, Alberta, to Little Bow. This company has been granted permission by the Canadian Parliament to construct an extension from Angeliers, Que., into the Rouyn mining district, a distance of over 50 miles.

The Central Vermont has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 200-ton frame coaling station and cinder plant at Brattleboro, Vt.

The Chesapeake & Ohio is making surveys for a bridge across the Ohio river at Cincinnati, Ohio. This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a water station at Gladstone, Va., to cost $25,000.

The Chicago & North Western will begin at once the construction of a bridge over its tracks at Folsom Place in Milwaukee, Wis., to abolish a grade crossing at that point.

The Chicago & Western Indiana has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the laying of 7,000 ft. of 6-in. and 8-in. high pressure pipe line, to cost approximately $50,000, at its 51st St. shops in Chicago.

The Chicago, Burlington & Quincy has awarded a contract to G. A. Johnson & Son, Chicago, for the construction of a new passenger station at Shenandoah, Ia., reported in the June issue.

The Chicago, Milwaukee & St. Paul contemplates the construction of a grain elevator at Milwaukee, Wis., to replace an elevator destroyed by fire on June 17. This company will pay 40 per cent of the total cost of $40,000 for the construction of a subway under its tracks west of Renton, Wash., on the Pacific Highway. T. R. Beeman, engineer of the King Company, Seattle, is preparing plans for the construction.

The Chicago, Rock Island & Pacific has completed surveys for the construction of a 3½-mile spur at Keosauqua, Ia. and has applied to the Interstate Commerce Commission for authority to construct an extension from Billings to Owens, Okla., a distance of eight miles.

The Cleveland, Cincinnati, Chicago & St. Louis has awarded a contract to the Kuert Contracting Company, Indianapolis, Ind., for the construction of a pump house at Mt. Jackson, Indianapolis.

The Cleveland Union Terminal is calling for bids for the construction of a retaining wall along Ontario street south of Public Square in Cleveland, Ohio, and for excavation in connection with the new Union Station. The retaining wall contract will call for approximately 225,000 yds. of excavation; about 240,000 lbs. of steel sheet piling; the placing of some 6,000 yds. of concrete and about 800,000 lbs. of reinforcing bars. The wall will be approximately 500 ft. long and 20 to 40 ft. in height. This project is a part of the terminal company's program calling for the expenditure of approximately $10,000,000 this summer.

The Erie has awarded a contract to Frederick J. Parker, Philadelphia, for the elimination of grade crossings on Section C of its improvement project at Paterson, N. J. The work involved in the Section C contract includes the elevation of the railroad company's tracks to eliminate three highway grade crossings.

The Florida East Coast has authorized the construction of three 100-car capacity storage tracks with a lead track 15,837 ft. in length to connect with its yard at South Jacksonville, Fla., to cost approximately $99,000.

The Florida, Western & Northern, a subsidiary of the Seaboard Air Line, has received authority for the construction of 229 miles of new line in Florida which will provide, in connection with the existing lines of the Seaboard, a fairly direct cross-state line from West Palm Beach, Fla., to Tampa. The main line of the new company is to extend from Coleman to West Palm Beach, 205 miles, and a line from Callahan to Gross, 14 miles, is intended to serve as a cutoff in the Seaboard's through line to the north, while a line from Valrico to Welcome Junction, 10 miles, is intended to shorten the distance between Tampa and West Palm Beach. This company has also applied for authority to construct a line from Ocala to Anthony, Fla., 7 miles, and a 3-mile spur at Frost Proof, Fla.

The Grand Trunk Western has awarded a contract to Bierd, Lydon & Grandpre, Inc., Chicago, for the construction of the engine terminal at Battle Creek, Mich., reported in the June issue.

This company has also awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 500-ton concrete coaling station at Battle Creek, Mich.; a 350-ton concrete coaling station at Durand, Mich., and a 300-ton concrete coaling station at Grand Haven, Mich.

The Great Northern has awarded a contract to L. I. Stromsvold, Minot, N. D., for the rebuilding of 10 stalls of the enginehouse at Minot and has awarded a contract to J. A. Dinnie & Co., Grand Fork, N. D., for the rebuilding of 10 stalls of the enginehouse at Williston, N. D.

The Hocking Valley is contemplating the construction of a freight yard at Walbridge, Ohio, four miles south of Toledo.

The Illinois Central has awarded a contract to the Ellington-Miller Company, Chicago, for the construction of a 300 ft. by 67 ft. brick and steel mail terminal at Memphis, Tenn., reported in the April issue, and has awarded a contract to the W. J. Zitterell Company, Webster City, Ia., for the construction of a new passenger station, five concrete viaducts and an overhead bridge at Paxton, Ill., the project to cost $200,000. This company has started the construction of a subway for pedestrians 18 ft. wide under Michigan avenue at Van Buren street, in Chicago.

The Long View, Portland & Northern has awarded a contract to the Hart Construction Company, Tacoma, Wash., for the construction of 44 trestle bridges between West Kelso, Wash., and Vader, a distance of 20 miles.

The Kansas City Southern is reported to be making surveys for a branch line from Watts, Okla., to Grove, estimated to cost $100,000.

The Louisville & Nashville is calling for bids for the construction of a brick and steel machine and forge shop at Corbin, Ky. This company is preparing plans for the construction of a brick passenger station at Bowling Green, Ky., to cost approximately $200,000, and has awarded a contract to the Roberts & Schaefer Company for an electrically operated cinder plant at Gentilly, La.

This company has awarded a contract to Boullut & Williams, New Orleans, La., for the construction of a 50-ft. by 935-ft. two-story brick warehouse at New Orleans, La. Other improvements planned at New Orleans include the construction of a 36-ft. by 180-ft. brick enginehouse and a 16-ft. by 322-ft. two-story brick shop and storage building. This company plans the construction of a terminal at Gentilly, La., requiring 40,000 ft. of yard tracks; 23,000 cu. yds. of fill; a 90-ft. turn table; a 7-stall brick roundhouse; a 68-ft. by 32-ft. brick machine shop; and a 30-ft. by 50-ft. two-story brick office building; a 25-ft. by 40-ft. one-story frame engineer's register room, a 40-ft. by 100-ft. brick car department building; a 20-ft. by 55-ft. two-story frame locker building; a sand house, yard office and employees' shelters; 14,200 ft. of 8-in. cast iron pipe line; 1,100 ft. of 10-in. cast iron pipe line. The work at Gentilly, with the exception of the building, will be done by company forces. Plans for the building have not yet been completed.

The Missouri-Kansas-Texas, jointly with the Missouri Pacific and the city of Nevada, Mo., is considering the construction of a subway under the tracks at Walnut street in Nevada. The total estimated cost of $225,000 is to be divided among the railways and the city.

The Missouri Pacific has awarded a contract to Liston & Weatherly, St. Louis, Mo., for the construction of a three-mile spur track at Benton, Ill. This company is calling for bids for yard filling requiring approximately 100,000 cu. yds. of fill at Kansas City, Mo., and contemplates the construction of a branch line from Venice, Ark., to Crosset, a distance of 10 miles.

This company is preparing plans for the construction of a brick passenger station at Bastrop, La., is reported to be contemplating the construction of a freight station at McGehee, Ark., and has called for bids for the construction of an interlocking tower at Leavenworth, Kan.

The Mobile & Ohio contemplates the construction of a union station at Humboldt, Tenn., for joint use with the Louisville & Nashville.

The New York, Chicago & St. Louis contemplates the construction of a four-track bridge across the Rocky river at Cleveland, Ohio.

The New York, New Haven & Hartford has awarded a contract to C. W. Blakeslee & Sons for the construction of a highway bridge to replace an existing structure at New Haven, Conn. The total cost of the work is estimated at $90,000, of which a portion will be borne by the state and local governments. The present contract will total about $40,000.

The Norfolk & Western has authorized the construction of a freight station at Bluefield, W. Va., to cost approximately $650,000; an oil house at Roanoke, Va., to cost approximately $150,000; and station and track changes at Roxboro, N. C., at an approximate cost of $63,000. Contracts have been awarded respectively to the Virginia Bridge & Iron Company and the American Bridge Company for steel work on two bridges in the Cincinnati district, the first involving an expenditure of $18,650 and the second $51,000. The firm of Sturm & Dillard has the contract for masonry work on the second project, Geo. W. Kane, Roxboro, N. C., has the contract for the station construction work at Roxboro. The company has authorized the construction of 9.5 miles of second track on its Big Sandy line—to cost approximately $1,185,000—and H. M. Waugh has been awarded the contract for the grading.

The Northern Pacific plans the construction of a 12-mile branch line to Shelton, Wash., and is reported to be planning the construction of a passenger station at Big Lake, Minn.

The Oregon Short Line has awarded a contract to C. P. Anderson, Salt Lake City, Utah, for the construction of a passenger station at Nampa, Idaho, to cost approximately $125,000.

The Pacific Fruit Express plans the construction of car repair shops, paint shop and store sheds at Nampa, Idaho, to cost approximately $450,000.

The Pennsylvania has awarded a contract to the Whiting-Turner Construction Company, Baltimore, Md., for the application of concrete floors on its bridges over the Susquehanna river between Sunbury and Northumberland, Pa. The work will involve the expenditure of approximately $65,000. This company has awarded a contract to E. H. Reuss, Jr., Philadelphia, for the installation of piping at its new shops at Juniata, Pa., to cost approximately $40,000, also a contract to the Dunleavy Brothers Company, Coatesville, Pa., for the construction of a concrete road at Coatesville to cost approximately $20,000.

This company plans the immediate construction of a bridge across the Beaver river at New Brighton, Pa., with necessary relocation of tracks, the entire project to cost $2,000,000. This company also plans the construction of 20,000 ft. of track at its terminal at East Toledo, Ohio, the re-location of approximately 40,000 ft. of old track, the construction of yard offices and the separation of grade at Main street in Toledo. The bridge across the Ohio river at Steubenville, Ohio, is to be rebuilt.

The Pittsburgh, Fort Wayne & Chicago (Pennsylvania) has applied to the Interstate Commerce Commission for authority to construct a line from Canton to Bayard, Ohio, 15 miles.

The Prescott & Northwestern has received from the Interstate Commerce Commission an extension of time in which to begin the construction of an extension of 26 miles from Prescott, Ark., from July 1, 1924, to January 1, 1925, and has been granted permission to retain for five years all of the earnings of the new line in excess of the amount provided in Interstate Commerce Act.

The Reading has awarded a contract to George H. Evans, Inc., Philadelphia, for the furnishing and erection of a passenger station on the northbound side and a waiting room on the southbound side at Oaklyn, N. J., on its seashore lines. This company has also awarded a contract to the Bentley-Morrison Corporation, Elizabeth, N. J., for the excavation and furnishing of all labor and materials necessary in the construction of concrete foundations, concrete pits, and concrete pipe trenches at the company's creosoting plant at Port Reading, N. J. This company has awarded a contract to Martin & Breen, Inc., Philadelphia, for the grading, masonry and waterproofing in connection with the reconstruction of a bridge over Tohickon creek, north of Shelly, Pa., on its Bethlehem branch, and has awarded a contract to the Phoenixville Bridge Company, Phoenixville, Pa., for the furnishing and erection of the steel superstructure required for a bridge on its line west of Wyomissing, Pa.

The Seaboard Air Line has awarded a contract to the MacDougald Construction Company, Atlanta, Ga., for the filling

in of a trestle at Dallas, Ga., and the building of reinforced box culverts.

The Southern has awarded a contract to the Smallman-Brice Company, Birmingham, Ala., for the construction of a 10-story office building at Birmingham.

This company has awarded a contract for the construction of modern shop facilities for the repair of freight and passenger cars at Hayne, S. C., near Spartanburg, to Dwight P. Robinson, Inc. The following buildings will be erected: Steel freight car repair shop of fireproof construction, 390 ft. by 108 ft., equipped with electrically operated traveling cranes and served by five tracks; annex machine shop, 130 ft. by 50 ft.; coach shop of masonry and steel frame, 240 ft. by 180 ft.; coach paint shop, 200 ft. by 200 ft., with two-story annex for upholstery and other work, 120 ft. by 40 ft.; the coach and paint shop will each be served by ten tracks and by a transfer table of 80 ft. span in a pit 160 ft. long; storehouse and office, 140 ft. by 55 ft.; wash and locker house for employees, 105 ft. by 35 ft.; wheel shop, 105 ft. by 55 ft.; smith shop, 160 ft. by 100 ft.; planing mill, 160 ft. by 100 ft.; power house, 90 ft. by 150 ft.; oil house, 40 ft. by 25 ft.; dry kiln, 40 ft. by 20 ft.; dry lumber shed, 75 ft. by 25 ft.; scrap dock, 400 ft. by 52 ft.; reclaiming shop, 60 ft. by 35 ft.; and a service crane with 60 ft. span in a runway 760 ft. long. Approximately 10 miles of track will be constructed in connection with the plant which will be located on a slight grade from north to south so that bad-order cars, brought in from the north end, can be moved practically by gravity entirely through the shop. It is expected that work on the plant will begin as soon as men and materials can be assembled.

This company has received from the Interstate Commerce Commission a certificate authorizing the construction of an extension from Caswell to Beverly, Tenn., about four miles and has awarded a contract to C. R. Willard & Son, Spartanburg, S. C., for grading the concrete work on a new cut-off line to be built around the east side of the city of Spartanburg. The new line will eliminate a grade crossing on the Southern's Columbia division at Main street. The city has agreed to pay half of the cost of construction of the cut-off line, and at an election held recently bonds to the amount of $250,000 were voted for this purpose.

This company has awarded to the Foundation Company a contract for the design and construction of the John Sevier Yard near Knoxville, Tenn. The work under the contract covers the construction of a gravity classification yard, a 34-stall round house, a machine shop, a power house, cinder pits, freight transfer sheds, offices, stock pens, turntable, dwellings, track scales, culverts, bridges, retaining walls, grading, drainage, water supply and fire protection, signal system, a large amount of track work together with appurtenant buildings, equipment, etc. The contract involves the construction of some 51 miles of standard gage track and the development is so planned that it may be extended at a future date. The new classification yard will be about 3 miles long and will have a capacity of 2,229 cars. The Foundation Company is preparing the plans, drawings, designs and specifications and will begin actual construction shortly. A temporary camp to take care of 400 men is being established. The work under the present contract will be completed in about a year.

The Southern Pacific, reported in the June issue as having completed plans for the construction of a freight car repair plant at Houston, Tex., has awarded a contract for three major and six minor buildings to Fred B. Chambers, Houston, Tex. The structures will be of mill construction; the largest will be 186 by 400 ft., the next 40 ft. by 208 ft., and the third 30 ft. by 100 ft.

This company, jointly with the El Paso & Southwestern, contemplates lowering its tracks in the city of El Paso, Tex., to eliminate grade crossings and is reported to be planning the construction, early in 1925, of a yard at Stockton, Cal., to have a capacity of 1,000 or more cars.

The St. Louis-San Francisco contemplates the construction of a hospital at Springfield, Mo., at an estimated cost of $500,000.

This company contemplates the construction of a brick passenger station at Fordyce, Ark., and has closed bids for the construction of a brick and concrete passenger station at Neodesha, Kan., and for the construction of a stucco passenger and freight station at Sikeston, Mo.

This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a power house and steam and air lines at its East Thomas terminal near Birmingham, Ala.

The Thompson & Clark Timber Company has awarded a contract to the Atlans Construction Company, Vancouver, B. C., for the construction of a logging road from Courtney, Vancouver Island, to Horn Lake, a distance of 13 miles.

The Union Pacific has awarded a contract to Morrison & Knutson, Boise, Idaho, for the laying of steel on the extension from Crane, Ore., to Burns.

The Wabash has prepared plans for a two-story 40 ft. by 140 ft. addition to its hospital building at Decatur, Ill.

The Western Pacific has awarded a contract for the construction of a 10-stall concrete enginehouse with machine shop and storehouse at Stockton, Calif.

The Wyoming & Colorado Short Line has applied for authority to construct and operate a line from Casper, Wyo., in a generally southwesterly direction to the Colorado-Utah state line and the acquisition and operation of lines wholly or partly constructed along the route. Charles B. Duffy is president and R. H. Matson counsel, Cheyenne, Wyo.

The Mellon Institute of Industrial Research of the University of Pittsburgh has founded an Industrial Fellowship on the treatment of timber. This research, which is being sustained by the Grasselli Chemical Company, Cleveland, Ohio, and is being conducted by Dr. A. M. Howald, has for its purpose a study toward improvement of the methods of applying zinc chloride in the wood-preservation industry. Investigational work which was begun during 1923 will be continued throughout the present year. An experimental wood-impregnating plant is maintained for practical tests of processes. Research is at present being done on the development of a method of increasing the permanence of zinc chloride treatments of timber by the addition of petroleum oils.

The Federal Trade Commission has issued an order directing the United States Steel Corporation, the American Bridge Company, the American Sheet & Tin Plate Company, the Carnegie Steel Company, the American Steel & Wire Company, the Illinois Steel Company, the Minnesota Steel Company, and the Tennessee Coal, Iron & Railroad Company, to cease from using the "Pittsburgh Plus" system of basing prices of rolled steel products such as plates, bars, structural steel, sheets, tin plates, wire and wire products, which consists of fixing the price on product manufactured outside the Pittsburgh district at the Pittsburgh price plus an amount equivalent to the freight rate from Pittsburgh to the point of manufacture. The Commission finds that this practice is contrary to the public interest and an unfair method of competition which adds materially to the cost of steel products.

A total of 100,000,553 arrests were reported by 87 Class I railroads to the protective section of the American Railway Association during 1923. A total of 87,502 persons or 87.3 per cent of those arrested were convicted. For the first six monhts of 1923 the claim payments due to robbery totaled $1,620,800 or 7.1 per cent of the total claim payments, as compared with $2,976,791, or 10.9 per cent of the total freight claim payments for the same period of 1922. This is a decrease of 43.4 per cent during a period when the number of cars loaded with revenue freight increased 18.6 per cent. Since the formation of the protective section of the A. R. A. in 1921 robberies have shown a marked decline. In 1921 all classes of robberies caused payment of $9,924,747, or 10.3 per cent of the grand total of freight claim payments, of which payments on clothing, tobacco, shoes, automobiles, fruits and vegetables totaled $6,820,182, or 68.7 per cent. Robbery charges in 1922 aggregated $4,806,720, or 10 per cent of the total claim payments, which is a decrease of 51.1 per cent from 1921.

Supply Trade News

Personal

Clyde P. Ross, contracting manager of the **Roberts & Schaefer Company,** Chicago, has been elected third vice-president. **Charles Corwin,** field superintendent, has been promoted to general superintendent of construction, succeeding P. T. Brackett, resigned.

Harvey T. Gracely, advertising manager of the **Marion Steam Shovel Company,** Marion, Ohio, has been promoted to assistant sales manager. **Clarence E. Silva,** formerly in the engineering department, has been promoted to advertising manager to succeed Mr. Gracely.

H. C. Breidert, contracting engineer at the Chicago office of the **Fort Pitt Bridge Works,** has been transferred to the main office, Oliver building, Pittsburgh, Pa., as chief contracting engineer. **E. K. Adams** succeeds Mr. Breidert as contracting engineer in Chicago.

William S. Boyce, special representative of the **Railroad Supply Company,** has been appointed assistant to the president in charge of sales. He was born in Del Rio, Tex., and graduated from the Agricultural and Mining College of Texas with the degree of civil engineer following which he entered the maintenance department of the National Railways of Mexico. He returned to the United States in 1909 to enter the employ of the Chicago Great Western in the maintenance of way department and was later appointed roadmaster. Subsequently, he resigned to enter the employ of the Atchison, Topeka & Santa Fe as a roadmaster and in 1911 he entered the railway supply field. In 1923 he became associated with the Railroad Supply Company as a special representative, with headquarters at Chicago, which position he has held until his recent appointment.

K. E. Kellenberger, signaling department editor of the **Railway Age** and editor of **Railway Signaling,** publications associated with *Railway Engineering and Maintenance,* has been appointed eastern manager for the National Safety Appliance Company in charge of sales and service in the territory east of the Rocky Mountains, with headquarters in Chicago. Mr. Kellenberger was born in Yates Center, Kan., on December 5, 1883. He attended Ottawa University at Ottawa, Kan., for two years, after which he entered Purdue University, from which he graduated in electrical engineering in 1907. Following his graduation he became a special signal apprentice on the Pennsylvania Lines West of Pittsburgh, with headquarters at Logansport, Ind. In October, 1909, he was transferred to Canton, Ohio, where he remained until October 10, 1910, when he resigned to enter the employ of the Chicago & North Western as signal inspector in connection with the construction of the important interlocking work of the Chicago terminal. In December, 1910, he was promoted to division signal foreman on the Wisconsin division and in June, 1911, he was promoted to signal inspector in charge of construction for the Chicago & North Western system. On March 1, 1913, he was made signal supervisor for the West Iowa, Sioux City, and Northern Iowa divisions and the lines west of the Missouri river, with headquarters at Boone, Iowa. He held this position until August 26, 1914, when he received an appointment as senior railway signal engineer in the division of valuation, Interstate Commerce Commission, with headquarters at Chicago. In December, 1917, he resigned to become signaling department editor of the Railway Age and editor of the Railway Signal Engineer, which position he has held until his recent appointment.

K. E. Kellenberger

General

The Truscon Steel Company has moved its Chicago office to 165 E. Erie street.

The New Jersey Zinc Company is building a rolling mill at Palmerton, Pa., for the rolling of zinc sheets, a new product of the company.

The Grip Nut Company, Chicago, has acquired a tract of land at 5917 S. Western avenue, on which it will lay out a golf course covering two acres which may be used by employees and visitors to the factory.

The Industrial Works, Bay City, Mich., has opened a district office at 455 Monadnock Building, San Francisco, Calif., with **J. M. McGuire,** construction and erecting engineer, appointed district sales manager in charge.

The Fairmont Railway Motors, Inc., has opened a Pacific coast branch office at 637 Mission street, San Francisco, Calif., with **R. W. Jamison** as district sales manager for the states of California, Washington, Oregon and Nevada.

The Northwest Engineering Company, Chicago, has appointed the **George B. Curd Equipment Company** with a main office in Cincinnati, O., and district offices in Indianapolis, Ind., and Lexington, Ky., as its representatives to handle the sale of its gasoline convertible cranes, draglines and shovels in that territory.

The Roberts & Schaefer Company, Chicago, and the **R. H. Beaumont Company,** Philadelphia, Pa., builders of boiler house coal and ash handling plants, have made arrangements whereby the Roberts & Schaefer Company has the exclusive right to use certain Beaumont patents on railroads and the R. H. Beaumont Company has the exclusive right to use certain coal handling patents owned by the Roberts & Schaefer Company.

Donald W. Kingsley, assistant manager of **S. F. Bowser & Co.,** with headquarters at Dallas, Tex., has been promoted to manager of the Detroit office. **Paul W. Lawcher,** of the Ft. Wayne sales division, has been promoted to manager of the new Memphis office. **E. E. Springer,** district manager, with headquarters at Atlanta, Ga., has been promoted to manager of the new Birmingham, Ala., office. **E. B. French,** manager of the Atlanta office, has been promoted to sales superintendent, with headquarters at Washington, D. C., and will be succeeded by **H. C. Carpenter,** of the Atlanta office. **R. S. Caldwell,** assistant sales manager, with headquarters at Ft. Wayne, Ind., has been promoted to manager of the Philadelphia division. This company has completed the construction of a new two-story building with approximately 20,000 sq. ft. of floor space at San Francisco, Cal., which will be used as the headquarters of the branch office and warehouse.

Trade Publications

Paint.—A bulletin has been issued by the Eagle-Picher Lead Company, 208 South La Salle street, Chicago, setting forth the advantages of painting with sublimed blue lead and furnishing specifications for its use. While the major portion of the bulletin is devoted to a consideration of blue lead, attention is also given to other products manufactured by the company, including paint pigment ground in oil and dry and metal products, numbering in all 24 varieties.

Motor Car Instructions.—A combined catalog of repair parts, price list and instruction book for the four-horsepower Fairmont inspection cars has been issued to supersede all previous publications of like character relative to this equipment. The new booklet contains 60 pages, in the usual pocket size binding and is prepared throughout for the ready use of the motor car operator, with detailed descriptions of the way in which the car operates, as well as instructions as to making repairs and overcoming the various troubles that may be encountered. New bulletins have also been issued on the Fairmont magneto equipment and the lighter weight engines.

The studs assure a much stronger, more flexible fence less likely to give under strain and eliminate forcing down and distorting the mesh of the fence.

The improved anchor that grips like a hand, found only in the improved Century Steel Post, is a positive assurance against post becoming loose in the ground under any conditions.

Designed and Constructed for Permanent Service

The permanency and strength of your fence depends upon the security of the anchor plate on the post. That is why we have given much attention to this part of the Improved Q & C Century Steel Post, which has resulted in perfecting an anchor that becomes part of the post.

Q & C Century Steel Fence Posts have a big advantage over wood posts in that they allow a big saving in storage space. Coming in bundles of five posts, they are easy to handle and count—every post is guaranteed to rigid specifications. We will be glad to furnish prices upon request.

The Q & C Company, 90 West St., New York

Chicago San Francisco St. Louis.

Place hook end on one side of post and bring other end under fencing, which should rest on one of the studs. With a few taps of the hammer, the other end of the staple is closed over the edge of the post and thus locked securely. This means of fastening allows for contraction and expansion of fencing without breakage.

steel SHOVEL

Built for Hard Work

ALL HUBBARD Super-Steel Shovels are of the Riveted Back Type, with heavy gauge straps, tough alloy blades, and the finest Northern Ash handles obtainable.

The rivets are grooved or sunken to prevent contact—they cannot pull out or wear through. Notice the illustration—see how the rivets are placed. Note the workmanship of the shovel.

We were not satisfied with the ordinary Brinnell and other standard tests—we devised our own tests to graphically show the strains this remarkable shovel will stand.

Specify HUBBARD Super-Steel on your next order and get the finest, strongest shovel ever made—you will like it.

Hubbard & Company
Pittsburgh, Penna.

Fig. 1—Two men forcing handle down. Blade is gripped three inches from edge. The shovel was held in this position for several minutes. When released, it instantly sprung back into place with no appreciable distortion.

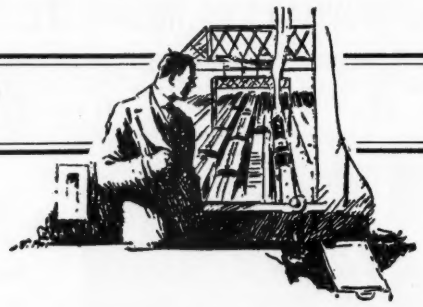
Fig. 2—Shows the condition of blade after released—note that it has changed form very slightly, and it is still as good as new—the rivets and straps are in no way damaged or pulled.

A heat treated chrome molybdenum alloy steel shovel

Fig. 3—A man weighing 160 pounds is standing on the shovel handle—but, note there is no break—no decided give or sag—only a uniform bending of blade. After this test the blade resumes its original shape with no change in form that is noticeable.

Better Shovel!

Buyers' Guide



CLASSIFIED INDEX OF ADVERTISERS

Acetylene, Dissolved.
Air Reduction Sales Co.

Adjustable Guard Rail Clamps.
Wharton Jr. & Co., Wm.

Air Compressors.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Hoists
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Lift Pumping Systems.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors, Rail.
Lundie Engineering Co.
P. & M. Co.

Anti-Creepers, Rail.
Lundie Engineering Co.
P. & M. Co.

Apparatus, Brazing, Welding and Cutting, Heat Treatment.
Air Reduction Sales Co.

Asphalt.
Lehon Co.

Ballast Spreaders.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Band Saws.
American Saw Mill Machinery Co.

Barge Cranes.
Industrial Works.

Bars.
Bethlehem Steel Co.

Bearings, Axle, Motor & Push.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Company.

Bearings, Roller.
Hyatt Roller Bearing Co.

Benders, Rail.
Buda Co.
Q. & C. Co.
Verona Tool Works.

Billets.
Bethlehem Steel Co.

Blasting Powders.
Dupont de Nemours & Co., E. I.

Blasting Supplies.
DuPont de Nemours & Co., E. I.

Blow Pipes, Oxy-Acetylene.
Air Reduction Sales Co.

Bolts.
Bethlehem Steel Co.

Bonding, Rail, Outfits.
Ingersoll-Rand Co.

Brazing.
Air Reduction Sales Co.

Bridge Jacks.
Buda Co.

Buckets, Clamshell.
Blaw-Knox Co.
Industrial Works.

Building Papers.
Lehon Co.

Buildings, Sectional, All Steel.
Blaw-Knox Co.

Bumping Posts.
Buda Co.
Mechanical Mfg. Co.

Burners, Bunsen, Acetylene.
Air Reduction Sales Co.

Calcium Carbide.
Air Reduction Sales Co.

Carbarrow.
American Trackbarrow Co.

Cars, Ballast.
Clark Car Co.

Cars, Dump.
Clark Car Co.
Western Wheeled Scraper Co.

Cars, Industrial.
Clark Car Co.
Western Wheeled Scraper Co.

Cars, Motor Inspection.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Cars, Motor Section.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Cars, Spreader.
Clark Car Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Cars, Velocipede.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Cast Iron Pipe.
McWane Cast Iron Pipe Co.

Castings.
Bethlehem Steel Co.

Cattle Passes.
Massey Concrete Products Corp.

Centrifugal Pumps.
American Well Wooks.
Goulds Manufacturing Co.

Clamshell Buckets.
Blaw-Knox Co.
Industrial Works.

Coaling Stations.
Chicago Bridge & Iron Works.

Combination Crane Pile Driver.
Industrial Works.

Compromise Joints.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

Condensers.
Ingersoll-Rand Co.

Conduits.
Diamond State Fibre Co.

Corrugated Iron.
Armco Culvert & Flume Mfrs. Assn.

Cranes, Electric, Erecting, Locomotive, Piller, Transfer, Tunnel and Wrecking.
Industrial Works.

Creosoted Timber.
International Creosoting & Construction Co.

Crossings, Highway, Bituminous.
Headley Good Roads Co.

Crossings, Rail.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Crossing Gates.
Buda Co.

Crushers, Stone.
Western Wheeled Scraper Co.

Culvert Pipe.
Armco Culvert & Flume Mfrs. Assn.
McWane Cast Iron Pipe Co.
Massey Concrete Products Corp.

Curbing.
Massey Concrete Products Corp.

Cutting, Oxy-Acetylene.
Air Reduction Sales Co.

Deep Well Pumps.
American Well Works.
Goulds Mfg. Co.

Derails.
Q. & C. Co.
Wharton Jr. & Co., Wm.

Discing Machines.
Fairmont Railway Motors, Inc.

Ditchers.
Jordan Co., O. F.

Drill Steel, Rock.
Ingersoll-Rand Co.

Drop Forgings.
Bethlehem Steel Co.

Dump Cars.
Clark Car Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Dynamite.
DuPont de Nemours & Co., E. I.

Electric Cranes (Locomotive, Pillar, Transfer, Wrecking).
Industrial Works.

Electric Snow Melters.
Q. & C. Co.

Engines, Gasoline.
Buda Co
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co
Mudge & Co

Engines, Hand Car.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Explosives.
DuPont de Nemours & Co., E. I.

Fence, Fabric.
Cyclone Fence Co.

Fence Posts.
Massey Concrete Products Corp.
Q. & C. Co.

Fence.
Cyclone Fence Co.

Fibre Angle Pieces, Bushings, Plates, End Posts, Etc.
Diamond State Fibre Co.
Q. & C. Co.

Fibre Insulating.
Diamond State Fibre Co.
Q. & C. Co.

Filters.
American Water Softener Co.

Flanges, Snow.
Q. & C. Co.

Float Valves.
American Valve & Meter Co.

Floor Covering.
Lehon Co.

Forge Hammers.
Sullivan Machinery Co.

Forgings.
Bethlehem Steel Co.

Frogs.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Gages, Measuring
Lufkin Rule Co.

Gages, Pressure-Gas.
Air Reduction Sales Co.

Gantry Cranes.
Industrial Works.

Gas, Acetylene.
Air Reduction Sales Co.

Generators, Acetylene.
Air Reduction Sales Co.

Girder Rail.
Bethlehem Steel Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grading Machinery.
Western Wheeled Scraper Co.

Graphite.
Dixon Crucible Co., Jos.

Grinders, Portable.
Buda Co.
Ingersoll-Rand Co.

Guard Rails.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Guard Rail Clamps.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Hand Car Bearings.
Hyatt Roller Bearing Co.

Hand Cars.
Buda Co.

Hammer Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hammers, Steam.
Industrial Works.

Heaters, Feed Water.
American Water Softener Co.

Highway Crossings, Bituminous.
Headley Good Roads Co.

Hose.
Ingersoll-Rand Co.

House Lining.
Lehon Co.

Hydrogen.
Air Reduction Sales Co.

Insulated Rail Joints.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

Insulating Materials.
Diamond State Fibre Co.

Jacks, Track.
Buda Co.
Duff Mfg. Co.
Idol Track Liner Co.
Verona Tool Works.

Joints, Rail.
Bethlehem Steel Co.
Rail Joint Co.
Q. & C. Co.
Wharton Jr. & Co., Wm.

Junction Boxes.
Massey Concrete Products Corp.

Knuckles, Emergency.
Q. & C. Co.

Lead, Sublimed.
Eagle Picher Lead Co.

Leaders, Pile Drivers.
Industrial Works.

Liners, Track.
Idol Track Liner Co.

Lock Washers.
National Lock Washer Co.
Positive Lock Washer Co.
Reliance Mfg. Co.

Locomotive Cranes.
Industrial Works.

Lubricants.
Dixon Crucible Co., Jos.

Machinery, Grading.
Western Wheeled Scraper Co.

Machinery, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Magnet Cranes.
Industrial Works.

Manganese Track Work.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Manholes.
Massey Concrete Products Corp.

Markers.
Massey Concrete Products Corp.

Metal Protection Paints.
Dixon Crucible Co., Jos.
Eagle Picher Lead Co.

Mile Posts.
Massey Concrete Products Corp.

Motor Bearings.
Hyatt Roller Bearing Co.

Motor Cars.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Mowing Machines.
Fairmont Railway Motors, Inc.

Nitrogen.
Air Reduction Sales Co.

Nut Locks.
National Lock Washer Co.
Positive Lock Washer Co.
Reliance Mfg. Co.
Verona Tool Works.

Nuts.
Bethlehem Steel Co.

Oil Engines.
Buda Co.
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co.

Oil Houses.
Massey Concrete Products Corp.

Out Houses.
Massey Concrete Products Corp.

Outfit, Welding.
Air Reduction Sales Co.

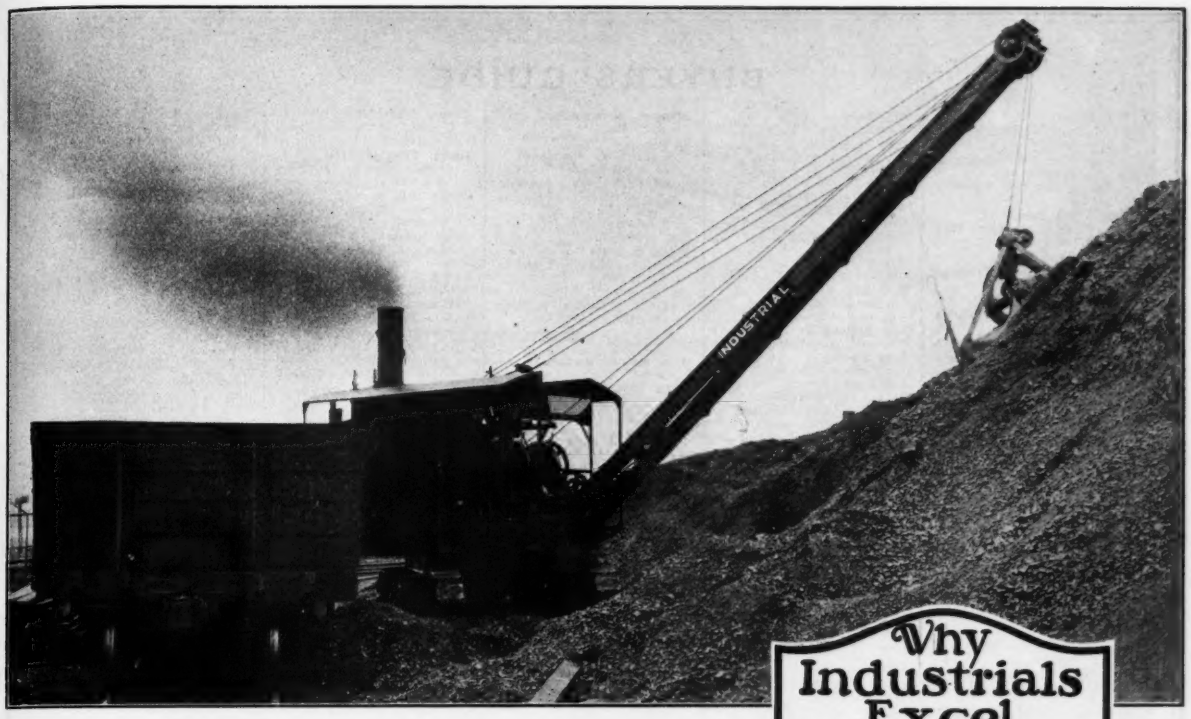
Oxygen.
Air Reduction Sales Co.

Oxy-Acetylene Welding.
Air Reduction Sales Co.

Paints.
Dixon Crucible Co., Jos.
Eagle Picher Lead Co.

Pavement Breakers.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Penstocks.
American Valve & Meter Co.



A 50-man-power masterpiece

THIS LATEST INDUSTRIAL crawling tractor locomotive crane is producing 50-man-power results in handling the heavy loads of industry. It is cutting deep into the high costs of manual material-handling and recovering a buried treasure of non-productive dollars.

The new type D is a masterpiece of design and construction. Its outstanding superiority is guaranteed by America's pioneer crane builders. Over fifty years of untarnished business integrity and highly specialized skill and experience form its background.

This newest INDUSTRIAL has a greater field of usefulness in industry than any other material-handling equipment on the market today. As a crawling tractor it goes everywhere. With its accessories, including clamshell bucket, electro-magnet, hook and block, shovel dipper arm, dragline bucket, wood grapple and pile driving leaders, it will conquer any material-handling problem at a tremendous saving in time and labor.

This latest INDUSTRIAL is fully illustrated and described in a 16-page bulletin just off the press. Ask for Book No. R-120 and it will be sent to you promptly.

INDUSTRIAL WORKS
BAY CITY - MICHIGAN

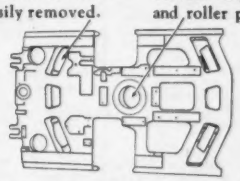
Locomotive Cranes, 5 to 200 Tons -- Transfer, Pillar & Gantry Cranes
Railway Pile Drivers -- Combination Crane Pile Drivers -- Transfer Tables
Portable Rail Saws -- Grab Buckets -- Magnets -- Steam Pile Hammers

Why Industrials Excel

13 MASSIVE STEEL BASE

Without jacking up base, steel conical rollers easily removed.

Center pin nut adjusts all play between bedplate and roller path.

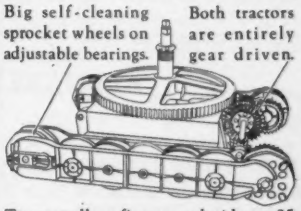


Entire upper machinery rests on a single massive steel rotating bedplate, insuring perfect alignment and preventing sticking clutches, undue gear wear and bent shafts.

14 HIGH TRACTOR ROLLERS

Big self-cleaning sprocket wheels on adjustable bearings.

Both tractors are entirely gear driven.



Tractor rollers, five on each side are 25 inches in diameter. These large rollers decrease the traveling friction and keep bearings high up out of all mud and dirt.

INDUSTRIAL
CRAWLING TRACTOR CRANES

BUYERS' GUIDE

Pile Drivers.
Industrial Works.

Piling.
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Pipe, Cast Iron.
McWane Cast Iron Pipe Co.

Pipe Carriers.
Massey Concrete Products Corp.

Pipe Concrete.
Massey Concrete Products Corp.

Pipe, Corrugated.
Armco Culvert & Flume Mfrs. Assn.

Pipe Joint Compound
Dixon Crucible Co., Jos.

Plants, Welding and Cutting.
Air Reduction Sales Co.

Platforms, Station.
Headley Good Roads Co.

Plows, Railroad.
Western Wheeled Scraper Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles.
International Creosoting & Construction Co.
Massey Concrete Prod. Corp.

Pony Car.
American Trackbarrow Co.

Posts, Fence.
Q. & C. Co.

Posts, Bumping.
Buda Co.
Mechanical Mfg. Co.

Powders.
DuPont de Nemours & Co., E I

Preservation, Timber.
International Creosoting & Construction Co.

Producers, Gas.
Air Reduction Sales Co.

Pumps, Air Pressure and Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Sump.
American Well Works.
Goulds Mfg. Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Push Car Bearings.
Hyatt Roller Bearing Co.

Push Cars.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Rails.
Bethlehem Steel Co.

Rail Anchors.
Lundie Engineering Corp.

Rail Anti-Creepers.
Lundie Engineering Corp.

Rail Benders.
Buda Co.
Q. & C. Co.

Rail Bond.
Verona Tool Works.

Rail Braces.
Bethlehem Steel Co.
Buda Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Rail Joints.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.
Wharton Jr. & Co., Wm.

Rail Saws, Portable.
Industrial Works.
Q. & C. Co.

Rail Springs.
Verona Tool Works.

Rare Gases.
Air Reduction Sales Co.

Red Lead.
Eagle Picher Lead Co.

Regulators, Oxy-Acetylene.
Air Reduction Sales Co.

Removers, Paint and Varnish.
Eagle Picher Lead Co.
Mudge & Co.

Replacers, Car.
Buda Co.

Riveting Hammers.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Rivets.
Bethlehem Steel Co.

Rock Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Rods, Welding.
Air Reduction Sales Co.

Roller Bearings.
Hyatt Roller Bearing Co.

Roof Slabs.
Massey Concrete Products Corp.

Roofing Composition.
Lehon Co.

Rules.
Lufkin Rule Co.

Saw Mills.
American Saw Mill Machinery Co.

Saws, High Speed Friction.
American Saw Mill Machinery Co.

Saws, Portable Rail.
Industrial Works.
Q. & C. Co.

Saw Rigs.
American Saw Mill Machinery Co.

Scales.
Lufkin Rule Co.

Scrapers, Wheel, Drag and Buck.
Western Wheeled Scraper Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Sewer Pipe.
Massey Concrete Products Corp.

Sheet Fibre.
Diamond State Fibre Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.

Shingles, Composition.
Lehon Co.

Shovels.
Hubbard & Company
Wood Shovel & Tool Co.

Signal Foundations, Concrete
Massey Concrete Products Corp.

Skid Shoes.
Q. & C. Co.

Slabs, Concrete.
Massey Concrete Products Corp.

Smoke Stacks.
Chicago Bridge & Iron Works.
Massey Concrete Products Corp.

Snow Melting Devices.
Q. & C. Co.

Snow Plows.
Jordan Co., O. F.
Q. & C. Co.

Spikes.
Bethlehem Steel Co.

Spreaders.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Standpipes.
Chicago Bridge & Iron Works.

Standpipes (Penstock).
American Valve & Meter Co.

Stands, Switch and Target.
Bethlehem Steel Co.
Q. & C. Co.
Ramapo Ajax Corp.

Station Houses.
Massey Concrete Products Corp.

Steel Forms.
Blaw-Knox Co.

Steel Plates and Shapes.
Bethlehem Steel Co.

Step Joints.
Q. & C. Co.
Rail Joint Co.

Storage Tanks.
Chicago Bridge & Iron Works.

Structural Steel.
Bethlehem Steel Co.

Sublimed Lead, Blue, White
Eagle Picher Lead Co.

Switches.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switch Locks.
American Valve & Meter Co.

Switchmans' Houses.
Massey Concrete Products Corp.

Switchstands and Fixtures.
American Valve & Meter Co.
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Tampers, Tie.
Ingersoll-Rand Co.

Tanks, Water Storage.
Chicago Bridge & Iron Works

Tanks, Elevated Steel.
Chicago Bridge & Iron Works

Tanks, Oil Storage
Chicago Bridge & Iron Works

Tank Valves
American Valve & Meter Co

Tapes
Lufkin Rule Co

Tee Rails.
Bethlehem Steel Co.

Telegraph Poles
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Thawing Outfits.
Q. & C. Co.

Ties.
International Creosoting & Construction Co.

Tie Plates.
Bethlehem Steel Co.
Lundie Engineering Corp.

Tie Plate Clamps.
Q. & C. Co.

Tie Rods.
Bethlehem Steel Co.

Tie Tampers.
Ingersoll-Rand Co.

Tie Tongs.
Maintenance Engineering Corp.

Timber, Creosoted.
International Creosoting & Construction Co.

Tool Steel.
Bethlehem Steel Co.

Tools, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Tools, Wrecking.
Industrial Works.

Tongue Switches.
Bethlehem Steel Co.
Buda Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Torches, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Track Barrow.
American Trackbarrow Co.

Track Drills.
Buda Co.
Ingersoll-Rand Co.

Track Insulation.
Diamond State Fibre Co.
Q. & C. Co.

Track Jacks.
Buda Co.
Duff Mfg. Co.
Idol Track Liner Co.
Verona Tool Works.

Track Liner.
Idol Track Liner Co

Track, Portable.
Western Wheeled Scraper Co.

Track Tools.
Buda Co.
Hubbard & Company
Q. & C. Co.
Verona Tool Works.

Transfer Tables.
Industrial Works.

Treating Plants, Water.
American Water Softener Co.

Trestle Slabs.
Massey Concrete Products Corp.

Vacuum Pumps.
American Well Works.
Goulds Mfg. Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Ventilators.
Q. & C. Co.
Q. & C. Co.

Washers, Fibre.
Diamond State Fibre Co.

Water Column.
American Valve & Meter Co.

Water Crane.
American Valve & Meter Co.

Water Softening Plants.
American Water Softener Co.

Water Treating Plants.
American Water Softener Co.

Water Tanks.
Chicago Bridge & Iron Works.

Water Treating Tanks.
Chicago Bridge & Iron Works.

Waterproofing Fabrics.
Lehon Co.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

Wharf Cranes.
Industrial Works.

Wheels, Hand and Motor Car.
Buda Co.
Fairmont Railway Motors, Inc.
Mudge & Co.

Wire Fencing.
Cyclone Fence Co.

Wood Grapples.
Industrial Works.

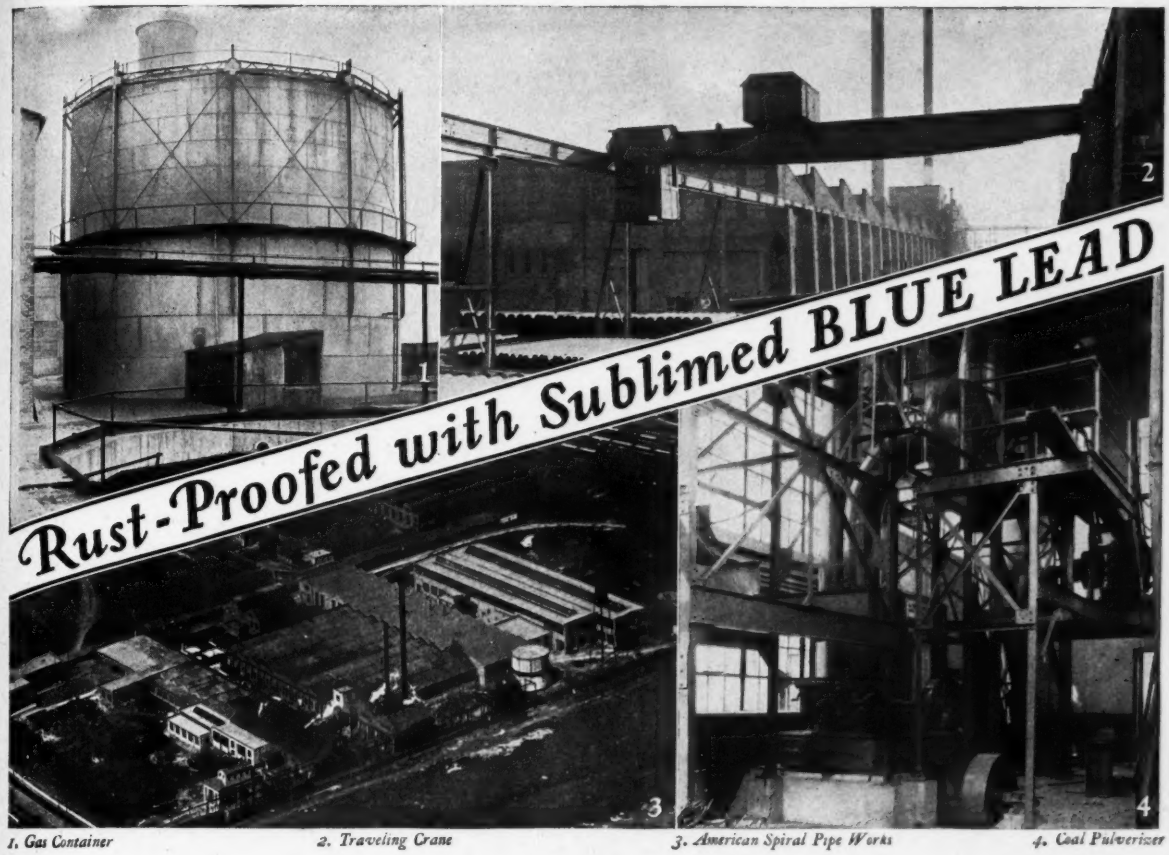
Wood Preservation.
International Creosoting & Construction Co.
Q. & C. Co.

Woodworking Machnery.
American Saw Mill Machinery Co.

Wrecking Cranes.
Industrial Works.

Wrecking Tools.
Industrial Works.

ALPHABETICAL INDEX TO ADVERTISEMENTS



1. Gas Container *2. Traveling Crane* *3. American Spiral Pipe Works* *4. Coal Pulverizer*

Rust-Proofing Worries Were Ended at This Plant in 1910

FOR fourteen years the American Spiral Pipe Works has standardized on Sublimed Blue Lead in Oil for all rust-proofing purposes. Exposed to many different conditions, indoors and out, to excessive heat and corrosive gases as well as to the corroding action of the elements, Sublimed Blue Lead in Oil has successfully met every requirement for a rust-inhibitive paint at this plant. Today they say:

> "Over a period of more than 14 years, since 1910, Eagle-Picher Sublimed Blue Lead has proven to be the most satisfactory and durable rust-proofing pigment that we have ever used on the various steel structures about our plant, exposed to many different conditions."—American Spiral Pipe Works.

Sublimed Blue Lead in Oil works so easily and smoothly under the brush that a painter can cover a greater area in a day and still produce a paint film that is free from breaks, runs, or alligatoring. The paint film is properly elastic and virtually insensible to changes in temperature.

One hundred pounds of Sublimed Blue Lead in Oil will cover 5216 square feet of iron or steel. This is equivalent to a surface a foot wide and nearly a mile long. It will not harden in the container.

The durability of Sublimed Blue Lead in Oil as a long-time protector of metal surfaces has been proved both in technical tests and in the field.

Send for your copy of "Fighting Rust with Sublimed Blue Lead."

Send for "Fighting Rust with Sublimed Blue Lead" —a Rust-Proofing Manual

The EAGLE-PICHER LEAD COMPANY · 856-208 *South La Salle Street* · CHICAGO

EAGLE *Picher Sublimed* BLUE LEAD *in* OIL

CINCINNATI CLEVELAND PITTSBURGH PHILADELPHIA NEW YORK MINNEAPOLIS
BUFFALO DETROIT BALTIMORE NEW ORLEANS KANSAS CITY ST. LOUIS JOPLIN

Plants: CINCINNATI NEWARK GALENA, KAS. HENRYETTA, OKLA. PICHER, OKLA.
EAST ST. LOUIS, ILL. CHICAGO ARGO, ILL. JOPLIN, MO. HILLSBORO, ILL. (2 *Plants*)